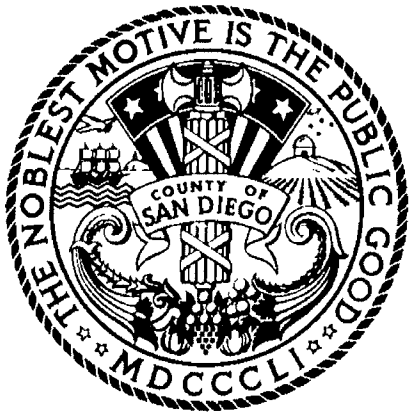

County of San Diego

Low Impact Development Handbook:

Stormwater Management Strategies

RESPONSE TO PUBLIC COMMENTS

December 27, 2007

Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123-1666

This page intentionally left blank for reproduction purposes.

Introduction

The County of San Diego received a total of 100 written comments from 8 different organizations and individuals on the draft Low Impact Development (LID) Handbook: Stormwater Management Strategies document dated July 20, 2007. Where ever appropriate, each comment has been responded to within this document. Many comments suggested textual revisions to the document. In these cases, the comment is responded by a notation as to whether it was accepted and rejected.

This Response to Comments document has been prepared as a courtesy to those stakeholders who have taken the time to assist us in making our document a better one. The comments are responded to in the order of date received. Copies of the actual comment letters are also included for reference.

The County of San Diego appreciates the efforts of all those who contributed by commenting on the draft LID Handbook and Appendices. The comments have resulted in significant changes to text within the Handbook and have been influential to the County's future direction of the LID program.

The final revised Handbook and Appendices will be made available on the County of San Diego Department of Planning and Land Use Website: www.sdcounty.ca.gov/dplu. If you have any questions regarding these Responses to Comments, please contact us directly.

Thank you for your assistance in preparing this LID Manual.

Joseph M. DeStefano II, MSE, CPP
Land Use/Environmental Planning Manager
County of San Diego Department of Planning and Land Use
MSCP Division, Watershed Planning Section (M.S. O326)
5201 Ruffin Rd., Ste. P., San Diego, CA 92123
858-694-3692 (Direct Dial) · 858-694-3541 (Facsimile)
Joseph.DeStefano@sdcounty.ca.gov

Christine A. Sloan
Supervising Environmental Health Specialist
County of San Diego Department of Public Works
Watershed Protection Program (M.S. O326)
5201 Ruffin Rd., Ste. P., San Diego, CA 92123
858-549-5257 (Direct Dial) · 858-694-3541 (Facsimile)
Christine.Sloan@sdcounty.ca.gov

This page intentionally left blank for reproduction purposes.

A. Letter from J. Roberts, dated July 26, 2007

This page intentionally left blank for reproduction purposes.

July 26, 2007

Low Impact Development Handbook, Stormwater Management Strategies, July 20, 2007
Written comments must be received by August 20, 2007
and may be submitted to: Ms. Christine Sloan
Watershed Project Manager
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123
or by e-mail to Christine.Sloan@sdcounty.ca.gov

Comments on the July 20, 2007 draft

Dear Ms. Sloan,

Thank you for your efforts to help address low impact development and water management strategies. Naturally these issues are also related to how we accommodate our natural plant communities and the damages that are typically and unnecessary inflicted through excavation and habitat clearing.

Botanical protection

A-1

1. Since considerable damages are inflicted against native species, which provide for greatly improved rain water absorption, low to no maintenance requirements, high drought tolerance, along with food for native species, while avoiding an out-of-place or artificial appearance for the region. Consequently some realistic consideration and protection should be afforded California's native plant species, particularly local indigenous species that are an indigenous part of the area's natural drainage basin, along with a special permit requirement for the clearance of native plant species, which would be based on a requirement to perform full restoration for damaged areas, including oak woodlands, native walnut trees and other large species.

Geological structures

A-2

2. Bulldozing of land and the natural geologic structures under undisturbed land, which provides considerable slope stability, should be avoided in all cases except perhaps for a minimum width roadway, naturally using only highly permeable pavers and aggregates if pavement is necessary, as the draft suggests is helpful. Alternatives to bulldozing land

for construction include adjusting the floor supports to match the contour of the terrain, not force the geology to match the first floor through excavation, by permanently defacing a hillside or mountain, and preparing a long-term future of gradual slippage or hillside collapse. If a builder demands a level lot then they shouldn't buy mountainous property and then try to convert it into flat land, the results are extraordinarily destructive, unappealing and often present disastrous long term consequences, based on engineering reports that are little more than a guess of future hydraulic loading, rainfall and geologic disruptions that are the result of bulldozing. Further bulldozing doesn't save the builder money, it's far less costly to simply build a level floor on an undisturbed slope than to level a mountain, which can cost $25000 to $50000 to permanently devastate even a small parcel.

Construction hazards and environmental destruction

A-3

3. Any structure which is not secure in its environment for any reason, simply needs to be reconsidered in terms of its structural, seismic or fire safety. The environment cannot be blamed or devastated due to of a lack of consideration or engineering diligence on the part of the builder. In our arid climate where plants have evolved over millions of years to recycle and reseed themselves using periodic fires, it's obviously more of a requirement of the builder to use nonflammable materials, including: metal, stone, tile, reinforced glass, concrete or stucco; and not overtly damage, clear or excavate the natural landscape. People who are fearful of the natural landscape don't have a right to destroy it, just to avoid wilderness. The restoration cost of one acre of oak woodlands can exceed $3 million, with costs over $20 per square foot to fully restore a diverse chaparral habitat which can take at least 3 decades to accomplish, with considerable expert help and an automated irrigation system. Wilderness is far more valuable and costly to replace than any house in the county. Homes with exteriors which are not flammable, and without flammable curtains in the windows, do not burn in fires, even when there is no brush clearance. An undisturbed natural environment is completely safe, if all you know is just from this one paragraph. The majority of homes that burned in the 2003 fire had tar paper (so-called composite shingle) roofs and were in urban subdivisions far from any wilderness. Naturally wooden homes with tar paper roofs in the chaparral also did burn; however stucco homes with metal shake roofs, with little or no clearing around them did not burn. Any 6 year old should be able to deduce all of this. Further chaparral landscapes which were not cleared had little if any erosion evident anywhere, along with far better rain water absorption, which was more evenly distributed in the soils, and resulted in far more stable slopes, with less property loss and fewer safety risks. Incidentally having been in a major fire and watching flames in

direct contact with oaks, walnut and other large trees for over 3 hours, it's obvious how extraordinarily fire resistant native trees are; after all, a tree that can live to be 800 or 1000 years in age can't burn down every 20 years; and it's also obvious how safe it is in a large fire if you build appropriately; in fact it's safe outdoors during a fire if you're not on a slope, and are at the bottom of a canyon or on a ridge line; where you can incidentally often find dry unburned grass after the fire. Of course buying a 3M face mask for about $100 with a very fine filter can also help get rid of the eye sting from any smoke. Obviously anyone can be safe and comfortable in a wilderness environment without damaging the native plants. However if they are regularly overwhelmed by ignorance and fear from television news, why would they ever consider living in such a beautiful environment, then aggressively pursue its destruction?

Informational assistance

A-4

4. Naturally when property owners are educated on tools for the long term protection of natural landscapes, several disastrous consequences can be averted, that would no doubt sooner or later eventually be inflicted by some less than considerate future buyer, or at least the county could require financial restitution for habitat damages based on a lien secured by the real property damaged, as well as of the party doing the damages. Additional examples of low impact architectural techniques could help prospective buyers and builders by illustrating beneficial solutions, naturally such examples are not particularly prevalent in the popular press. In fact the mass media is regularly being paid to promote extraordinarily high-impact subdivisions, which promote needless and costly conflicts with more environmentally considerate approaches. Naturally we have experienced several decades of governmental prohibitions against our own efforts to implement extremely low impact architectural and environmental standards for our lands, and understand that county planning will continue to block environmental consideration in many other areas perhaps permanently, no doubt for reasons that may not be either apparent or relevant to county zoning, planning or engineering departments, as well as continue to permit unnecessarily destructive subdivisions. While any review of low impact environmental issues is certainly greatly welcomed, we also hope that the subject could continue to be explored in much greater detail.

High-rise and environmental mitigation

A-5

5. One high-rise building per square mile is another approach to low environmental impact offered by Frank Lloyd Wright during the 1920's and described in his book The Living City, which naturally doesn't mean erecting big dull boxes that get passed off as

architecture, but 3 dimensional gardens or sculpted spires that contribute to the beauty of the landscape, at least as well as any ancient structures accomplished. Wright's 1956 high-rise, which is now a hotel in Bartlesville Oklahoma, successfully demonstrated a portion of this vision, along with his 1959 Marin County building north of San Francisco. Of course the disinterested claim that these qualities cannot be understood or described, perhaps for personal business reasons, or more realistically to conceal greed and incompetence. Well all such issues can be described without being confining, without limiting progress, without damaging anyone's budget or causing environmental losses. Construction of any type could be defined to economically result in a net environmental gain by mitigating at least 20 acres for every acre used, as well as being economically sustainable. Of course county regulations would still no doubt prohibit such a low impact environmental approach, perhaps on a permanent basis.

Stopping carcinogenic, environmental and economic disasters

A-6

6. Naturally it's incomprehensible how Sempra Energy could be allowed to build almost 700 pylons 160 feet tall to carry an array of hot sagging 500,000 volt aluminum cables, causing over $6 billion in property losses alone, along with serious carcinogenic impacts to promote the Sunrise Powerlink, while 2.5 megawatt wind turbines are illegal except on Indian reservations, and while lower cost underground DC power lines which have been proven in long distance applications around the world are not even considered an option by Sempra, SDG&E, the CPUC or the County, all because some lead engineer at Sempra is more familiar with the older AC transformer technology. Why not out law overhead long haul power lines, since more economical underground alternatives are more reliable, certainly far safer, and numerous examples, which include engineering, medical and economic details are available to prove the case. Naturally I don't believe that being oblivious is a virtue. If you know of anyone in the county who could address such needless and massive environmental impacts which are being promoted for these overhead high power lines, then please forward any comments.

Thank you for all your considerate efforts,

J Roberts, e-m@mail.com

A. County of San Diego Responses to Letter from J. Roberts

A-1 Botanical Protection "Since considerable damages are inflicted against native species, which provide for greatly improved rain water absorption, low to no maintenance requirements, high drought tolerance, along with food for native species, while avoiding an out of place or artificial appearance for the region. Consequently some realistic consideration and protection should be afforded California's native plant species, particularly local indigenous species that are an indigenous part of the area's natural drainage basin, along with a special permit requirement for the clearance of native plant species, which would be based on a requirement to perform full restoration for damaged areas, including oak woodlands, native walnut trees and other large species."

RESPONSE: The philosophy behind Low Impact Development (LID) is to protect significant native vegetation and conserve areas with well draining soils which naturally perform a water quality benefit. Under the County Resource Protection Ordinance and Biological Mitigation Ordinance, as well as the Multiple Species Conservation Program, mechanisms are already in place to protect native vegetation and significant trees. The LID Handbook dovetails with these mechanisms and reminds project applicants that protection of these resources not only helps the environment but provides them with a way to meet their stormwater requirements while at the same time complying with specific ordinances.

A-2 Geological Structures: "Bulldozing of land and the natural geologic structures under undisturbed land, which provides considerable slope stability, should be avoided in all cases except perhaps for a minimum width roadway, naturally using only highly permeable pavers and aggregates if pavement is necessary, as the draft suggests is helpful. Alternatives to bulldozing land for construction include adjusting the floor supports to match the contour of the terrain, not force the geology to match the first floor through excavation, by permanently defacing a hillside or mountain, and preparing a long-term future of gradual slippage or hillside collapse. If a builder demands a level lot then they shouldn't buy mountainous property and then try to convert it into flat land, the results are extraordinarily destructive, unappealing and often present disastrous long term consequences, based on engineering reports that are little more than a guess of future hydraulic loading, rainfall and geologic disruptions that are the result of bulldozing. Further bulldozing doesn't save the builder money, it's far less costly to simply build a level floor on an undisturbed slope than to level a mountain, which can cost $25,000 to $50,000 to permanently devastate even a small parcel."

RESPONSE: The County of San Diego understands the commenter's concern about unnecessary grading. County Ordinance and State Law provide specific requirements about stability of building areas, including ground compaction. The County of San Diego Grading Ordinance and Building Code provide specific conditions and requirements for development. The County is presently reviewing its ordinances to encourage the use of LID techniques. However, LID is a Stormwater Strategy used to preserve a sites hydrologic function, mimic nature, and allow for development by using integrated small engineered solutions. As such, some of the commenter's concerns are beyond the scope of this document.

A-3 Construction Hazards and Environmental Destruction: "Any structure which is not secure in its environment for any reason, simply needs to be reconsidered in terms of its structural, seismic or fire safety. The environment cannot be blabbed or devastated due to of a lack of consideration or engineering diligence on the part of the builder. In our arid climate where plants have evolved over millions of years to recycle and reseed themselves using periodic fires, it's obviously more of a requirement of the builder to use nonflammable materials, including: metal, stone, tile, reinforced glass, concrete or stucco; and not overtly damage, clear or excavate the natural landscape. People who are fearful of the natural landscape don't' have a right to destroy it, just to avoid wilderness. The restoration cost of one acre of oak woodlands can exceed $3 million, with costs over $20 per square foot to fully restore a diverse chaparral habitat which can take at least 3 decades to accomplish, with considerable expert help and an automated irrigation system. Wilderness is far more valuable and costly to replace than any house in the county. Homes with exteriors which are not flammable, and without flammable curtains in the windows, do not burin in fires, even when there is no brush clearance. An undisturbed natural environment is completely safe, if all you know is just from this one paragraph. The majority of homes that burned in the 2003 fire had tar paper (so-called composite shingle) roofs and were in urban subdivisions far from any wilderness. Naturally wooden homes with tar paper roofs in the chaparral also did burn; however stucco homes with metal shake roofs, with little or no clearing around them did not burn. Any 6 year old should be able to deduce all of this. Further chaparral landscapes which were not cleared had little if any erosion evident anywhere, along with far better rain water absorption, which was more evenly distributed in the soils, and resulted in far more stable slopes, with less property loss and fewer safety risks. Incidentally having been in a major fire and watching flames in direct contact with oaks, walnut and other large tress for over 3 hours, it's obvious how extraordinarily fire resistant native trees are; after all, a tree that can live to be 800 or 1000 years in age can't burn down every 20 years; and it's also obvious how safe it is in a large fire if you build appropriately; in fact it's safe outdoors during a fire if you're not on a slope, and are at the bottom of a canyon or on a ridge line; where you can incidentally often find dry unburned grass after the fire. Of course buying a 3M face mask for about $100 with a very fine filter can also help get rid of the eye sting from any smoke. Obviously anyone can be safe and comfortable in a wilderness environment without damaging the native plants. However if they are regularly overwhelmed by ignorance and fear from television news, why would they ever consider living in such a beautiful environment, then aggressively pursue its destruction?"

RESPONSE: The County of San Diego acknowledges and appreciates this comment. However, the issues raised are not at variance with the existing content of the document. During the development process, evaluation of 100 feet of fire clearing from all structures is performed, which is the recommended distance for clearance by fire authorities. Please refer to the LID Handbook, Appendix E for Fire Safety Considerations and to the County of San Diego Fire Code.

A-4 Informational Assistance "Naturally when property owners are educated on tools for the long term protection of natural landscapes, several disastrous consequences can be averted, that would no doubt sooner or later eventually be inflicted by some less than considerate future buyer, or at least the county could require financial restitution for

habitat damages based on a lien secured by the real property damaged, as well as of the party doing the damages. Additional examples of low impact architectural techniques could help prospective buyers and builders by illustrating beneficial solutions, naturally such examples are not particularly prevalent in the popular press. In fact the mass media is regularly being paid to promote extraordinarily high-impact subdivisions, which promote needless and costly conflicts with more environmentally considerate approaches. Naturally we have experienced several decades of governmental prohibitions against our own efforts to implement extremely low impact architectural and environmental standards for our lands, and understand that county planning will continue to block environmental consideration in many other areas perhaps permanently, no doubt for reasons that may not be either apparent or relevant to county zoning, planning or engineering departments, as well as continue to permit unnecessarily destructive subdivisions. While any review of low impact environmental issues is certainly greatly welcomed, we also hope that the subject could continue to be explored in much greater detail."

RESPONSE: The County of San Diego acknowledges and appreciates this comment. However, the issues raised are not at variance with the existing content of the document. The County of San Diego reviews all development proposals within its jurisdiction for potential impacts as required under the California Environmental Quality Act and for consistency with our General Plan and Community Plans, and their respective implementing ordinances. The General Plan, Community Plans, and related ordinances are presently being reviewed to ensure that LID techniques do not conflict.

A-5 High-rise and Environmental Mitigation "One high-rise building per square mile is another approach to low environmental impact offered by Frank Lloyd Wright during the 1920's and described in his book The Living City, which naturally doesn't mean erecting big dull boxes that get passed off as architecture, but 3 dimensional gardens or sculpted spires that contribute to the beauty of the landscape, at least as well as any ancient structures accomplished. Wright's 1956 high-rise, which is now a hotel in Bartlesville Oklahoma, successfully demonstrated a portion of this vision, along with his 1959 Marin Country building north of San Francisco. Of course the disinterested claim that these qualities cannot be understood or described, perhaps for personal business reasons, or more realistically to conceal greed and incompetence. Well all such issues can be described without being confining, without limiting progress, without damaging anyone's budget or causing environmental losses. Construction of any type could be defined to economically result in a net environmental gain by mitigating at least 20 acres for every acre used, as well as being economically sustainable. Of course county regulations would still no doubt prohibit such a low impact environmental approach, perhaps on a permanent basis."

RESPONSE: The County of San Diego acknowledges and appreciates this comment. However, the issues raised are not at variance with the existing content of the document, and are beyond the scope of this document. The County of San Diego is presently updating its General Plan and to include low-density land uses designations to protect rural lands.

A-6 Stopping Carcinogenic, Environmental and Economic Disasters: Naturally it's incomprehensible how Sempra Energy could be allowed to build almost 700 pylons 160 feet tall to carry an array of hot sagging 500,000 volt aluminum cables, causing over $6 billion in property losses alone, along with serious carcinogenic impacts to promote the Sunrise Powerlink, while 2.5 megawatt wind turbines are illegal except on Indian reservation, and while lower cost underground DC power lines which have been proven in long distance applications around the world are not even considered an option by Sempra, SDG&E, the CPUC or the County, all because some lead engineer at Sempra is more familiar with the older AC transformer technology. Why not out law overhead long haul power lines, since more economical underground alternatives are more reliable, certainly far safer, and numerous examples, which include engineering, medical and economic details are available to prove the case. Naturally I don't' believe that being oblivious is a virtue. If you know of anyone in the county who could address such needless and massive environmental impact which are being promoted for these overhead high power lines, then please forward any comments.

RESPONSE: The County of San Diego acknowledges and appreciates this comment. However, the issues raised are not at variance with the existing content of the document, and are beyond the scope of this document.

B. Email from Mark Brunette, dated August 8, 2007

This page intentionally left blank for reproduction purposes.

Sloan, Christine

From: Mark Brunette [MBrunette@ci.santee.ca.us]
Sent: Wednesday, August 08, 2007 11:57 AM
To: Sloan, Christine
Cc: Helen Perry; Melanie Kush
Subject: Comments on Draft LID Handbook and Appendices

Attachments: Mark Brunette.vcf

Mark Brunette.vcf
(321 B)

Christine,

I have relatively minor comments because overall I think the Handbook and Appendices are well written. There are some issues that we will need to address internally to determine if they are applicable to Santee, but I think it is an excellent guide and starting point.

1. The Conventional vs. LID Stormwater Approach flow chart on page 6 implies that there are no en route conveyance systems for the LID Approach. Does this imply that all stormwater is retained on site? B-1

2. I would suggest adding Parking and Landscaping Requirements under Land Use Planning on the Site Assessment Checklist on page 18. B-2

3. There appears to be no page 62 in the Handbook. B-3

Mark Brunette
Senior Planner
City of Santee
10601 Magnolia Avenue
Santee, CA 92071
Office: (619) 258-4100 x 158
Fax: (619) 562-9376
email: mbrunette@ci.santee.ca.us

Creating tomorrow's dynamic Community today
by implementing a Blueprint for the future
through excellence in Planning, Engineering,
Technology and Environmental Management

This page intentionally left blank for reproduction purposes.

B. County of San Diego Responses to Email from Mr. Mark Brunette, Senior Planner, City of Santee

B-1 "The Conventional vs. LID Stormwater Approach flow chart on page 6 implies that there are no en route conveyance systems for the LID Approach. Does this imply that all stormwater is retained on site?"

RESPONSE: LID attempts to treat as much stormwater as logistically possible onsite, while allowing the use of traditional stormwater controls en route if necessary. LID helps to reduce the volume, the peak energy of the flow, and provide water quality treatment prior to release into the municipal separate stormwater sewer system (MS4).

B-2 "I would suggest adding Parking and Landscaping Requirements under Land Use Planning on the Site Assessment Checklist on page 18."

RESPONSE: Comment accepted. The appropriate changes have been made to the Site Assessment Checklist.

B-3 "There appears to be no page 62 in the Handbook."

RESPONSE: Comment accepted. The appropriate change has been made.

This page intentionally left blank for reproduction purposes.

C. Letter from Dann E. Marquardt, P.E., dated August 10, 2007

This page intentionally left blank for reproduction purposes.

CITY OF
LA MESA
JEWEL of the HILLS

PLAN CHECK REVIEW COMMENTS

PUBLIC WORKS DEPARTMENT

8130 Allison Avenue, P.O. Box 937, La Mesa, CA 91944-0937
Telephone: (619) 667-1166 ■ Fax: (619) 667-1380

LID Public Review Comments: (1st Review) 08/10/2007

C-1
- Page 9; Incorrect grammar, the sentence should read like a list;
  Change the following sentence;
  "This can be accomplished by creating site design features that direct runoff to vegetated areas containing permeable/amended soils, protecting native vegetation and open space, and reducing the amount of hard surfaces and compaction of soil."
  To read;
  "This can be accomplished by creating site design features that; direct runoff to vegetated areas containing permeable/amended soils, protecting native vegetation and open space, and reducing the amount of hard surfaces and compaction of soil."

C-2
- Page 11; in text box change "brownfiels" to "brownfields".

C-3
- Page 17; add a blank line between paragraph 1.4 and Section 2.

C-4
- Page 20; new paragraph beginning "The upper soil layers…".

C-5
- Page 29; consider resizing the picture to remove the large gaps in the text created by the full width justification format.

C-6
- Page 31; same comment related to full width justification formatting.

C-7
- Page 35; grammar; change wording in the first paragraph to read "aesthetic appeal" or just "aesthetics".

C-8
- Page 40; grammar, revise last sentence of first paragraph to read "Retention and detention systems are most appropriate for areas where water percolates poorly through the soil."

C-9
- Page 40; in the second paragraph it mentions that detention systems may retain water for up to two weeks. A caution note or reference to the vector control portion of the document should be made to alert readers that mosquito larva can mature within one week during warmer weather.

C-10
- Page 62; if left blank intentionally, indicate so with the proper note "This page left intentionally blank."

C-11
- Page 48; for all of the sections related to porous pavement alternatives a discussion on the timing of the installation is important. Often with early installation the porous pavement section is rendered impaired or inoperative by construction traffic dirt and debris clogging the pours and the improper maintenance during the construction period. Installation during the later phases of a project would help ensure the paving alternative operating as designed.

COPIES TO: File

SENDER: **Dann E. Marquardt, P.E.**
Title: Associate Engineer
Department: Public Works/Engineering
Phone No: (619) 667-1337

(Original to Recipient)

C:\Documents and Settings\csloan.cosd\Local Settings\Temporary Internet Files\OLK91\LID public review comments.doc

This page intentionally left blank for reproduction purposes.

C. County of San Diego Responses to Letter from Mr. Dann E. Marquardt, P.E., Associate Engineer, City of La Mesa

C-1 "Page 9; Incorrect grammar, the sentence should read like a list;
Change the following sentence;
'This can be accomplished by creating site design features that direct runoff to vegetated areas containing permeable/amended soils, protecting native vegetation and open space, and reducing the amount of hard surfaces and compaction of soil.'
To read;
"This can be accomplished by creating site design features that; direct runoff to vegetated areas containing permeable/amended soils, protect~~ing~~ native vegetation and open space, and reduce~~ing~~ the amount of hard surfaces and compaction of soil."

RESPONSE: Comment accepted. The appropriate change has been made.

C-2 "Page 11; in text box change 'brownfiels' to 'brownfields'."

RESPONSE: Comment accepted. The appropriate change has been made.

C-3 "Page 17; add a blank line between paragraph 1.4 and Section 2."

RESPONSE: Comment accepted. The appropriate change has been made.

C-4 "Page 20; new paragraph beginning "The upper soil layers…".

RESPONSE: Comment accepted. The appropriate change has been made.

C-5 "Page 29; consider resizing the picture to remove the large gaps in the text created by the full width justification format."

RESPONSE: Comment accepted. The appropriate change has been made.

C-6 "Page 31; same comment related to full width justification formatting."

RESPONSE: Comment accepted. The appropriate change has been made.

C-7 Page 35; grammar; change wording in the first paragraph to read "aesthetic appeal" or just "aesthetics".

RESPONSE: Comment accepted. The appropriate change has been made.

C-8 Page 40; grammar, revise last sentence of first paragraph to read "Retention and detention systems are most appropriate for areas where water percolates poorly through the soil."

RESPONSE: Comment accepted. The appropriate change has been made.

C-9 Page 40; in the second paragraph it mentions that detention systems may retain water for up to two weeks. A caution note or reference to the vector control portion of the document should be made to alert readers that mosquito larva can mature within one week during warmer weather.

RESPONSE: Comment accepted. The appropriate change has been made.

C-10 Page 62; if left blank intentionally, indicate so with the proper note "This page left intentionally blank."

RESPONSE: Comment accepted. The appropriate change has been made.

C-11 Page 48; for all of the sections related to porous pavement alternatives a discussion on the timing of the installation is important. Often with early installation the porous pavement section is rendered impaired or inoperative by construction traffic dirt and debris clogging the pours and the improper maintenance during the construction period. Installation during the later phases of a project would help ensure the paving alternative operating as designed.

RESPONSE: Comment accepted. The appropriate change has been made to the Permeable Pavement Fact Sheets. Fact Sheet now includes:

- Install during a late phase of construction so that runoff will not enter and clog pavement pores.

D. Letter from Marsi A. Steirer, Deputy Director, Water Policy & Strategic Planning, City of San Diego Water Department, dated August 17, 2007

This page intentionally left blank for reproduction purposes.

THE CITY OF SAN DIEGO

August 17, 2007

VIA EMAIL

Ms. Christine Sloan
Department of Land Use and Planning
5201 Ruffin Road, Suite B
San Diego, CA 92123

Subject: Low Impact Development Handbook

Dear Ms. Sloan:

The City of San Diego (City) Water Department appreciates the opportunity to review the draft Low Impact Development (LID) Handbook and provide the following comments:

The Water Department owns and manages nine water source reservoirs within the county of San Diego. The Water Department places a high priority on improving and maintaining the quality of its drinking water supply reservoirs. High water quality is needed to provide for the long-term safety of the region's drinking water supply and to ensure a sustainable and cost-effective water treatment process. Additionally, water quality is important in supporting other beneficial uses of the reservoirs, including recreation and habitat for aquatic life.

In order to address water quality concerns within our reservoirs, the Water Department has developed the "Source Protection Guidelines for New Development." A copy of the Guidelines is enclosed for your reference. The Guidelines were developed in 2004 under the guidance of a Technical Advisory Committee which included members from different local jurisdictions (including the County of San Diego), water agencies, academia and the private sector. The Guidelines are user friendly and provide a menu of suggestions for incorporating LID practices for projects located within the watersheds of our reservoirs.

The Guidelines are necessary because they address pollutant concerns that are specific to source water protection. Data collected as part of our regular Watershed Sanitary Surveys reveal that nutrients (i.e., nitrogen and phosphorus) and total dissolved solids

Water Department
600 B Street, Suite 600, MS 906 • San Diego, CA 92101
Tel (619) 533-7595 Fax (619) 533-5325

(TDS) are the constituents of greatest concern from our source water protection perspective.

D-1

Because most of our reservoirs and watersheds are located outside of the City of San Diego boundaries and within the unincorporated areas under the jurisdiction of the County of San Diego and the cities of Escondido and Chula Vista, the Water Department would like to respectfully request that the Source Water Protection Guidelines be incorporated, by reference, into the final LID Handbook. Additionally, we would ask that language emphasizing the benefit and importance of LID to source water protection be incorporated into the final Handbook. Appropriate language can be extracted from the Source Water Protection Guidelines.

The incorporation of the above into the final LID Handbook would enhance source water protection for our region's reservoirs as well as provide consistency in storm water information in the San Diego Region. The Source Water Protection Guidelines can be viewed at the following link: http://www.sandiego.gov/water/operations/environment/swpg.shtml. We believe the Guidelines can serve as an important supplement to the Handbook in addressing LID practices within the watersheds of our reservoirs.

Finally, the Water Department would like to commend the emphasis that the LID Handbook places on the benefits of water conservation and the use of drought tolerant species for landscape purposes. While water conservation practices have the potential to yield important benefits for water quality, it should also be noted that water conservation is an important component of the region's overall strategy to secure a safe and reliable water supply.

Thank you for the opportunity to review the LID Handbook. The City of San Diego Water Department appreciates the time and effort the County has put into developing the LID Handbook and their dedication to preventing storm water pollution. We look forward to working with you in the future.

Sincerely,

Marsi A. Steirer, Deputy Director
Water Policy & Strategic Planning
City of San Diego Water Department

Enclosure: Source Protection Guidelines for New Development, January 2004

D. County of San Diego Responses to Letter from Marsi A. Steirer, Deputy Director, Water Policy & Strategic Planning City of San Diego Water Department

D-1 "...the Water Department would like to respectfully request that the Source Water Protection Guidelines be incorporated, by reference, into the final LID Handbook. Additionally, we would ask that language emphasizing the benefit and importance of LID to source water protection be incorporated into the final Handbook. Appropriate language can be extracted from the Source Water Protection Guidelines... The incorporation of the above into the final LID Handbook would enhance source water protection for our region's reservoirs as well as provide consistency in storm water information in the San Diego Region... We believe the Guidelines can serve as an important supplement to the Handbook in addressing LID practices within the watersheds of our reservoirs."

RESPONSE: The County of San Diego acknowledges and appreciates this suggestion. The County has included the Source Water Protection Guidelines in our LID Handbook Literature Index. The pollutant removal efficiencies for different filtration and infiltration techniques found in the Treatment Best Management Practices Technologies Matrix were particularly useful, and have been included in the Guidelines.

This page intentionally left blank for reproduction purposes.

E. Email from Linda Flournoy, Sustainability Consultant, Planning and Engineering for Sustainability dated August 18, 2007

This page intentionally left blank for reproduction purposes.

Sloan, Christine

From: linda flournoy [sustainableworld1@earthlink.net]
Sent: Saturday, August 18, 2007 5:55 PM
To: Sloan, Christine
Subject: Conmments Sec 1.1 - LID Handbook
Attachments: 070818 Sec 1-1 LID Manual comments (Linda F).doc

Hi Christine-
Again - great job.
I've written a few documents and know just how tough it can be, especially with hard deadlines.

I've been dong a "track changes" version of comments for you, but a few sections were more difficult to handle that way.
Those Sections I'll send separately like this. Give them a quick read-through and see if you think they get your point across in a way that's easier to read and more concise.

-----Original Message-----
From: "Sloan, Christine"
Sent: Jul 23, 2007 4:28 PM
To: Andrew Collison , Bill DePoto , Brad Monroe , Bruce Wulkan , Christina Hovland , David Hauser , Don Connors , Eric Berntsen , Erica Ryan , James Mumford , Jason Uhley , Jen Shira , Jennifer Weiland , Kathleen Copley , Ken Morgan , Kristin Lipska Borer , Linda Flournoy , Lisa Sanford , Maria Macario , Martin Miller , Martin Stallings , Marvin Sachse , Moy Yahya , Richard Gersberg , Rob Hutsel , Robert Cullen , Robert Goo , Rosanne Humphrey , Tom Frank , Vicki Driver , Wayne Green
Cc: "DeStefano, Joseph M." , "Oberbauer, Thomas A"
Subject: LID Handbook Public Review Notice

Greetings,

I am pleased to announce that the County of San Diego's Low Impact Development Handbook has been released for public review. You may access the documents at the following website: http://www.sdcounty.ca.gov/dplu/LID_PR.html

The document is open for review for 30 days from July 20th until August 20th, 2007. Comments can be sent to me either electronically or by mail at the address below. Please share this announcement with your colleagues and business associates.

Thank you,
Christine

Christine A. Sloan
LID Project Manager
Watershed / Environmental Planner

The County of San Diego
Department of Planning and Land Use
MSCP-Watershed Planning Division (M.S. O650)
5201 Ruffin Rd., Ste. B. San Diego, CA 92123
work: 858-495-5257 fax: 858-694-3373
Christine.Sloan@sdcounty.ca.gov

Linda Flournoy
Sustainability Consultant
Planning & Engineering for Sustainability
760-943-1972 (mess/fax)

760-809-5243 (cell - try 2x)
sustainableworld1@earthlink.net

E. County of San Diego Responses to Email from Linda Flournoy, Sustainability Consultant, Planning and Engineering for Sustainability dated August 18, 2007

E-1 "I've been dong a "track changes" version of comments for you, but a few sections were more difficult to handle that way. Those Secions I'll send separately..."

RESPONSE: The County of San Diego acknowledges and appreciates the comments and suggestions provided by Ms. Flournoy. Many of the suggested revisions to the text were accepted from the "redline/strikethrough" version of the text provided. For a detailed account of all text revisions accepted and rejected please contact Christine Sloan, Supervising Environmental Health Specialist with the DPW Watershed Protection Program at Christine.Sloan@sdcounty.ca.gov.

This page intentionally left blank for reproduction purposes.

F. Letter from Gabriel Solmer, Supervising Attorney, and Janet Park, Legal Intern, San Diego Coastkeeper dated August 20, 2007

This page intentionally left blank for reproduction purposes.

August 20, 2007

Department of Planning and Land Use
Project Processing Counter
5201 Ruffin Road, Suite B
San Diego, California 92123

SAN DIEGO COASTKEEPER

Re: San Diego County Low Impact Development Handbook and Appendices

Dear Ms. Christine Sloan:

On behalf of San Diego Coastkeeper, we would like to thank you for the opportunity to participate on the Low Impact Development (LID) Technical Advisory Committee, and allowing us to be involved with the formulation, discussion, and content of the San Diego County Low Impact Development Handbook and Appendices. We appreciate the hard work you and the San Diego County Department of Planning and Land Use have put into the implementation of LID principles for San Diego County. The introduction of these practices is a significant step towards improving water quality in San Diego watersheds and improving the quality of life for both people and marine life.

As the largest coastal advocacy organization in San Diego, we would like to comment on the public review draft of the LID Handbook. Overall, the LID Handbook is well organized and thorough; however there are some minor issues that Coastkeeper would like to point out. In addition to the issues below, we have retained Dr. Richard Horner as a technical consultant to review the LID Handbook. Dr. Horner's initial letter will be provided to you by August 20, 2007, with follow-up comments by the end of the month.

Comments on the LID Handbook:

F-1
- Section 1.3.4 mentions the "Stormwater Standards Manual." Please provide the author and date of publication for this document. It does not have a reference in the literature index or bibliography.

F-2
- Section 2.2.2 mentions "treatment train" without defining the phrase. This phrase needs definition and discussion.

F-3
- Section 2.2.4 discusses Minimizing Soil Compaction. Some language has been removed from previous drafts. This deletion makes the definition of soil compaction unclear. The LID Handbook must include the previously deleted phrase: "Minimization of soil compaction refers to minimizing the overall area of soil disturbance."

F-4
- Section 3 (Integrated Management Plans) should include an additional paragraph explaining the importance of a treatment train approach, since the section mentions utilizing more than one LID technique.

F-5
- Section 3.1.1.2 (Infiltration Basins) includes a picture of a basin in the Handbook, but not in the fact sheet. There is a picture of an infiltration trench in the fact sheets, but not the Handbook. The picture of the basin should be moved to the fact sheets to be consistent with the rest of the Appendices.

F-6
- Section 3.3, page 50, under street width considerations, has a typographical error. The words "vehicle_access" should be vehicle access.

2825 Dewey Road, Suite 200 San Diego, CA 92106 619-758-7743 ext. 109 Fax 619-224-4638 www.sdcoastkeeper.org

F-7

F-8

- Section 3.5, page 57, there is a footnote marking pointing to "1" in the third bullet point after the introduction paragraph. It is unclear where this footnote is located.
- Page 62 is left blank. It is unclear if this is intentional, since the page was not labeled as such.

Comments on the Appendices:

F-9

- Page 11, at the end of the Bibliography, the LID Literature index hyperlink is incorrect.

F-10

- Appendix 3, Section A: Climate should be introduced with the definition from the Handbook. Climate should be defined as a combination of temperature, precipitation and evapotranspiration.

F-11

- Appendix 3, Section D, (Under High Groundwater Conditions) the first sentence should read "In areas served *by* municipal drinking water..."

F-12

- Appendix 4, The introductory paragraph's sentence "The following fact sheets suggest techniques to reduce impervious surfaces, directly *disconnecting* impervious areas from storm drains, *maximizing* on-lot infiltration through vegetated and landscaped features, *maximizing* multi-use open space, and *minimizing* disturbance" should be changed to, "The following fact sheets suggest techniques to reduce impervious surfaces, directly *disconnect* impervious areas from storm drains, *maximize*..., *maximize*..., and *minimize*..." in order to use consistent verb tenses.

If Coastkeeper can provide further assistance, please do not hesitate to contact Gabriel Solmer with any requests or questions.

Sincerely,

Janet Park
Legal Intern
San Diego Coastkeeper

Gabriel Solmer
Supervising Attorney
San Diego Coastkeeper

F. Letter from Gabriel Solmer, Supervising Attorney, and Janet Park, Legal Intern, San Diego Coastkeeper

F-1 Section 1.3.4 mentions the "Stormwater Standards Manual." Please provide the author and date of publication for this document. It does not have a reference in the literature index or bibliography.

RESPONSE: Comment accepted. The appropriate change has been made.

F-2 Section 2.2.2 mentions "treatment train" without defining the phrase. This phrase needs definition and discussion.

RESPONSE: The County of San Diego respectfully disagrees with the commenter. "Treatment Train" was included in the definitions in Appendix 1, Glossary, Page 7; and is discussed in Section 2.3 on page 27.

F-3 Section 2.2.4 discusses Minimizing Soil Compaction. Some language has been removed from previous drafts. This deletion makes the definition of soil compaction unclear. The LID Handbook must include the previously deleted phrase: "Minimization of soil compaction refers to minimizing the overall area of soil disturbance."

RESPONSE: The County of San Diego respectfully disagrees with the commenter. The Municipal Permit does not require a "minimization of soil disturbance" but requires a "minimization of soil compaction". These are two very different things. Compacted soil creates a semi-impervious to impervious surface which should be minimized. However, the suggested sentence has been added in an amended form to make the intended point that a reduction in soil disturbance benefits water quality. The text now states to "minimize compaction" and encourages readers to "reduce the soil disturbance".

F-4 Section 3 (Integrated Management Plans) should include an additional paragraph explaining the importance of a treatment train approach, since the section mentions utilizing more than one LID technique.

RESPONSE: "Treatment train" was added without explanation as it had been explained in earlier sections.

F-5 Section 3.1.1.2 (Infiltration Basins) includes a picture of a basin in the Handbook, but not in the fact sheet. There is a picture of an infiltration trench in the fact sheets, but not the Handbook. The picture of the basin should be moved to the fact sheets to be consistent with the rest of the Appendices.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. The changes have been made as requested.

F-6 Section 3.3, page 50, under street width considerations, has a typographical error. The words "vehicle_access" should be vehicle access.

RESPONSE: Comment accepted. The appropriate change has been made.

F-7 Section 3.5, page 57, there is a footnote marking pointing to "1" in the third bullet point after the introduction paragraph. It is unclear where this footnote is located.

RESPONSE: Comment accepted. The footnote has been deleted.

F-8 Page 62 is left blank. It is unclear if this is intentional, since the page was not labeled as such.

RESPONSE: Comment accepted. The appropriate change has been made.

F-9 Page 11, at the end of the Bibliography, the LID Literature index hyperlink is incorrect.

RESPONSE: Comment accepted. The appropriate change has been made.

F-10 Appendix 3, Section A: Climate should be introduced with the definition from the Handbook. Climate should be defined as a combination of temperature, precipitation and evapotranspiration.

RESPONSE: Comment accepted. The appropriate change has been made.

F-11 Appendix 3, Section D, (Under High Groundwater Conditions) the first sentence should read "In areas served by municipal drinking water…"

RESPONSE: Comment accepted. The appropriate change has been made.

F-12 Appendix 4, The introductory paragraph's sentence "The following fact sheets suggest techniques to reduce impervious surfaces, directly disconnecting impervious areas from storm drains, maximizing on-lot infiltration through vegetated and landscaped features, maximizing multi-use open space, and minimizing disturbance" should be changed to, "The following fact sheets suggest techniques to reduce impervious surfaces, directly disconnect impervious areas from storm drains, maximize…, maximize..., and minimize…" in order to use consistent verb tenses.

RESPONSE: Comment accepted. The appropriate change has been made.

G. Letter from Scott Molloy, Public Policy Advocate, Building Industry Association of San Diego County, dated August 20, 2007

This page intentionally left blank for reproduction purposes.

9201 Spectrum Center Blvd., Suite 110
San Diego, CA 92123-1407

P 858.450.1221
F 858.552.1445

www.biasandiego.org

August 20, 2007

Ms. Christine Sloan
Watershed Project Manager
County of San Diego Dept. of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, CA 92123

RE: BIA Comments on LID Handbook

Dear Christine:

The Building Industry Association of San Diego County represents 1,450 member companies comprising a San Diego workforce of 150,000 men and women.

Thank you for this opportunity to provide comments on the county's Draft Low Impact Development Handbook and thank you for allowing us to participate in the County's LID Technical Advisory Committee.

The San Diego Region is highly unique in its combination of climatic and geologic conditions. Much of our soils are low permeability, expansive clay soils that are not conducive to infiltration and our rainfall events can be highly variable, sporadic and intense all in the same year. The combination of these two conditions makes Low Impact Development a major challenge for our Region. This challenge must be approached with careful consideration of potential adverse effects and unintended consequences as we implement a new, locally untested approach, the Low Impact Development stormwater management strategy.

Our industry is committed to do our part to address stormwater pollution. We have also been strong proponents of regional conservation planning such as the Multiple Species Conservation Program, urban revitalization and infill development, clustered development, transit and transit oriented development, and, in general, smart growth development, major components of reducing the impacts of stormwater pollution and preserving the integrity of our watersheds.

Ultimately, it will be necessary for cities to comprehensively address stormwater pollution on a regional, subregional and community level. The site-by-site approach to stormwater pollution will not solve our existing stormwater problems. As we move forward with implementing the new regulatory requirements of the Regional Water Quality Control Board Municipal Stormwater Permit, we cannot lose sight of this reality.

We offer the following general comments on the topic of LID. Please refer to the attachment entitled "BIA Comments on LID Handbook" included with this letter for our specific comments on the text of the handbook.

General Comments

G-1

Multiple Species Conservation Program (MSCP):

We appreciate the acknowledgement that compliance with the provisions of the MSCP and other biological and habitat protection ordinances and statutes accomplishes one of the principal tenets of Low Impact Development by clustering development areas and creating large blocks of open space. In terms of watershed protection, The MSCP is arguably the single most significant LID measure that has ever, or will ever be put in place in the County of San Diego. ***We believe that it is appropriate to acknowledge that relationship, and to provide LID credit to projects that accomplish this goal by setting aside or dedicating land for habitat or open space purposes.*** The larger focus should be on accomplishing the broader goals of LID and not simply whether those goals are accomplished by one piece of regulation or another.

G-2

LID and Existing Regulatory Barriers:

Many potential barriers to the implementation of LID techniques presently exist in the regulatory framework governing development in San Diego and California, including health and safety laws and codes, building codes, fire codes, street standards, and even other stormwater development standards, to name a few. In other situations, the LID standards will need to be married with existing development standards to avoid the creation of regulatory conflicts. A thorough review and analysis of all these potential barriers should be conducted to determine what standards and regulations need to be modified and, based on that analysis, what LID standards are appropriate for San Diego.

Christine, thank you again for all your hard work throughout this process. We greatly appreciate the opportunity we were given to participate in the process of developing the handbook and we cannot thank you enough for your efforts at tackling such a complex issue and bringing together so many different

perspectives and professional expertise on what is truly uncharted territory for the San Diego Region. We look forward to working with the County and other municipalities to find effective and practical solutions to stormwater management and implementing the Low Impact Development stormwater management strategy.

Very truly yours,

Scott C. Molloy
Public Policy Advocate

Attachment: BIA Comments on Low Impact Development Handbook

BIA Comments on Low Impact Development Handbook

Comment Number	Source	Page Number	Comment
G-3 1	LID Handbook	2/Figure 1	It is unclear what relationship this diagram is trying to show. Please clarify.
G-4 2	LID Handbook	11/Box	**Remove Groundwater Recharge.** Groundwater recharge is not a significant water supply source for the most the developed areas of San Diego County. The areas in the county where groundwater is an important source of water are predominantly rural and agricultural areas outside the storm drain system. Groundwater recharge in more urbanized areas may cause damage to property and infrastructure because of seeps, springs, expansive soils, collapsible soils, landslides, pavement and foundation failures, mold, mildew, etc.
G-5 3.	LID Handbook	11/3 Paragraph	Remove, "*Rainwater infiltration is needed for adequate groundwater recharge.....which can lead to increased risk of potential impacts from drought*". See comment 2 above.
G-6 4	LID Handbook	12/2nd Paragraph	Replace the word "*should*" in the statement: "Proposed stormwater infiltration plans, including permeable pavements, *should...*," with the word "*shall.*"
G-7 5	LID Handbook	16	We appreciate the acknowledgement that compliance with the provisions of the MSCP and other biological and habitat protection ordinances and statutes accomplishes one of the principal tenets of Low Impact Development by clustering development areas and creating large blocks of open space. In terms of watershed protection, The MSCP is arguably the single most significant LID measure that has ever, or will ever be put in place in the County of San Diego. ***We believe that it is appropriate to acknowledge that relationship, and to provide LID credit to projects that accomplish this LID goal by setting aside or dedicating land for habitat or open space purposes.*** The larger focus should be on accomplishing the broader goals of LID and not simply whether those goals are accomplished by one piece of regulation or another.

BIA Comments on Low Impact Development Handbook

G-8	6	LID Handbook	18	Update the checklist. Under the "Water" header add "Seeps or Springs" and Under the "Soils" header, add "Low Permeability Soils, Expansive Soils, Collapsible Soils, Landslides, Other Geologic Hazards and Conditions."
G-9	7	LID Handbook	20/Last Sentence	Replace the following wording: " The standard CEQA…with mitigation ~~and offsite~~ through preserve creation…"
G-10	8	LID Handbook	22/3rd Paragraph	Permeable patios and, in general, permeable pavements may not be appropriate immediately adjacent to building foundations. Also consider that private patios areas do not typically drain directly into a storm drain but into a landscape area.
G-11	9	LID Handbook	27/4th Paragraph	A statement should be added following the statement "…decrease the need for additional traditional stormwater control methods….." that explains that projects must also comply with the current drainage design manual and the LID design solutions must handle/convey the design storm event.
G-12	10	LID Handbook	28/2nd Paragraph	Remove sentence: "Because other infrastructure elements, such as sewer, power…these costs can also be reduced." Infrastructure costs vary substantially from site to site depending on many factors, not just the length or amount of material needed. While clustered subdivisions do generally reduce infrastructure costs, they also produce smaller lots, which have inherently less value than larger lots. In general, the manual should avoid rationalizing the economics of LID. See comment 18.
G-13	11	LID Handbook	29/1st Paragraph, Last Sentence	Replace the following wording: "Conserving natural resources…allowing roof runoff to run into ~~over~~ the lawn or other landscaping ~~before entering the stormdrain~~ are ~~non~~-infiltration techniques…"
G-14	12	LID Handbook	32/1st paragraph	Add the following language (underlined) to the statement "…minimizes stream bank erosion from high velocity flows, meeting important hydro-modification objectives."

BIA Comments on Low Impact Development Handbook

G-15	13	LID Handbook	34/4th Paragraph	Remove the word "finally" as follows: "~~Finally,~~ a portion of the required parking....." This is a solution which will most likely have a very limited application.
G-16	14	LID Handbook		The concept of reserve parking may be workable as long as there is regulatory flexibility to allow less than the total required parking to be provided on the site when the building is initially occupied, and as long as the parking provided is based on demand factors provided by the end user. This approach is probably not viable if the building is a "spec" building in which the end user is not know as opposed to a building that is constructed for a specific, identified occupant.
G-17	15	LID Handbook	35/4th Paragraph	Health and Safety Issue: is permeable pavement patio appropriate for a restaurant from a public health standpoint?
G-18	16	LID Handbook	35/4th Paragraph	Define what a "hybrid parking lot" is.
G-19	17	LID Handbook	37/2nd Paragraph	Replace the word "*should*" in the statement "...for a specific project *should* be reviewed..." with the word "*shall.*"
G-20	18	LID Handbook	48/1st Paragraph	Remove the following wording (strikeout) in the last sentence: "~~Similar high land values are found throughout the San Diego Area, and a~~As emphasis on stormwater management increase, the economic viability of these solutions may increase." ***The feasibility and marketability of LID in San Diego is not well understood at this time and high land values should not be a justification for increased regulatory standards (quite the opposite when weighing other important planning goals like affordable housing and economic growth).*** Instead, the manual should emphasize practical, proven techniques that are appropriate for San Diego's climatic and geologic conditions and avoid speculating on the feasibility of LID in the future.
G-21	19	LID Handbook	49/3rd Paragraph	A bullet item should be added that discusses the limitations of LID on streets with a grade of 5% or greater. Streets, driveways and private roads with grades above 5% may present infiltration challenges as water infiltrates at the top of the street only to

				seep out at the bottom under hydrostatic pressure.
G-22	20	LID Handbook	52/1st full paragraph, Last Sentence	Replace the word "greatly" as follows: "...the impact of streets on stormwater quality can be ~~greatly~~ effectively mitigated."
G-23	21	LID Handbook	57/2nd Paragraph	Remove, "both the maintenance and cost implications of these designs can be balanced by the improved aesthetic and market appeal of driveways made from more attractive, more permeable pavements." See comment 14.
G-24	22	LID Handbook	58/3rd Paragraph	Add the following sentence: " These designs can create significant maintenance issues however and they need to be landscaped appropriately.
G-25	23	LID Handbook	61/Section 3.6.5	It is not clear how a vegetated roof "extends the life of the roof." Most vegetated roofs will require at least one replacement in the typical life span of a concrete or ceramic tile roof, the standard Class A roofing material for San Diego County. Vegetated roofs are also expensive at $20+ per square foot. In a dry, sunny climate like San Diego's, more practical solutions might use the roof for solar and channel roof runoff into landscaped areas.
G-26	24	LID Handbook	64/3rd Full Paragraph, Last Sentence	Replace the word "non-potable" with "recycled or reclaimed."
G-27	25	LID Appendices	23	The fire departments require an all-weather surface that meets their loading requirements. The typical scenario is the installation of the public streets fronting the development with the final lift of pavement occurring once construction is completed and the risk of damage removed. The finished streets are then turned over to the City.
G-28	26	LID Appendices	37/Limitations	Infiltration basins are not feasible if the site has a steep slope.
G-29	27	LID Appendices	37/ Economics	This section states that infiltration basins can be "relatively cost-effective" however these costs do not include the cost of the land for the basin and infiltration basins tend to be land intensive.
G-30	28	LID Appendices	37/Limitations	Extended detention (dry) ponds are not feasible if the site has a steep slope.

G-31	29	LID Appendices	37/ Economics	This section states that Extended detention (dry) ponds can be "relatively cost-effective" however extended detention (dry) ponds tend to be land intensive. See comment 27.
G-32	30	LID Appendices	49/Design	A statement should be made to recommend that the mixing should be performed on-site so that a maximum of one hour between mixing and placing pervious concrete is maintained.
G-33	31	LID Appendices	53/Economics	Cost offsets may not occur due to the design storm requirement. In addition to incorporating LID techniques into projects, the municipalities Hydrology and Drainage Design Manuals must be satisfied for the design storm(s).
G-34	LID Site Design Examples			Some of the bulleted list of techniques at the bottom of each example have a footnote that says "Technique requires qualified, licensed professional's approval." Most if not all LID techniques should require this review and approval, including many on the bulleted lists which do not have this footnote. It would be better to put the footnote on the word "techniques" so that the reviewer knows to have any LID techniques reviewed and approved first.
G-35	Various/Throughout			Replace, "a qualified, listened professional" with, "Civil Engineer/Professional Engineer" in both text and footnotes throughout.

G. Letter from Scott Molloy, Public Policy Advocate, Building Industry Association of San Diego County, dated August 20, 2007

G-1 General Comments. Multiple Species Conservation Program (MSCP): "We appreciated the acknowledgement that compliance with the provisions of the MSCP and other biological and habitat protection ordinances and statues accomplishes one of the principal tenets of Low Impact Development by clustering development areas and creating large blocks of open space. In terms of watershed protection, the MSCP is arguably the single most significant LID measure that has ever, or will ever be put in place in the County of San Diego. *We believe that it is appropriate to acknowledge that relationship, and to provide LID credit to projects that accomplish this goal by setting aside or dedicating land for habitat or open space purposes.* The larger focus should be on accomplishing the broader goals of LID and not simply whether those goals are accomplished by one piece of regulation or another."

RESPONSE: The County of San Diego Departments of Planning and Land Use and Public Works anticipate looking at ways to offer LID credit to projects meeting MSCP and preservation goals in the future.

G-2 General Comments. LID and Existing Regulatory Barriers. "Many potential barriers to the implementation of LID techniques presently exist in the regulatory framework governing development in San Diego and California, including health and safety laws and codes, building codes, fire codes, street standards, and even other stormwater development standards, to name a few. In other situations, the LID standards will need to be married with existing development standards to avoid the creation of regulatory conflicts. A thorough review and analysis of all these potential barriers should be conducted to determine what standards and regulations need to be modified and, based on that analysis, what LID standards are appropriate for San Diego."

RESPONSE: The County of San Diego Department of Planning and Land Use and Department of Public Works will begin coordinating a consistency review of LID requirements with codes, policies, and ordinances once the final LID requirements become established by the Copermittees. The Model SUSMP containing these final LID requirements and restrictions is due to the Regional Water Quality Control Board in July 2008. Once the Model is accepted by the RWQCB, local jurisdictions are given one year to update all of their implementing codes and ordinances to allow for the new LID requirements.

G-3 LID Handbook. Page 2/Figure 1. It is unclear what relationship this diagram is trying to show. Please clarify.

RESPONSE: The figure has been deleted in the final version of the document.

G-4 LID Handbook. Page 11/Box. Remove Groundwater Recharge. Groundwater recharge is net a significant water supply source for the most the developed areas of

San Diego County. The areas in the county where groundwater is an important source of water are predominantly rural and agricultural areas outside the storm drain system. Groundwater recharge in more urbanized areas may cause damage to property and infrastructure because of seeps, springs, expansive soils, collapsible soils, landslides, pavement and foundation failures, mold, mildew, etc.

RESPONSE: The County of San Diego respectfully disagrees with the commenter. Groundwater recharge is a significant aspect of LID, which provides for the natural infiltration of stormwater. The LID Handbook is intended to be a jurisdictional document. The County of San Diego's jurisdiction is primarily rural, undeveloped, or preserved in open space in the more arid regions of Region 9. Although there are a few significant areas that have high groundwater due to a foreign source (irrigation infiltration) near the boundaries of the City of San Diego, and other municipalities, these areas are proportionately small compared to the vast arid lands which have seen an increased depletion of groundwater over the years. If other municipalities wish to adopt his handbook for use in their own jurisdictions, groundwater recharge may be a topic that should be removed. However, groundwater recharge is a desired aspect of LID within the County of San Diego's jurisdictional boundaries. Development within County areas such as Valley Center and Ramona which have high groundwater will be alerted to the infiltration restriction during planning and building plan review. As a compromise, the County of San Diego has modified the language within the text box to include "(where needed)".

G-5 LID Handbook. Page 11, Paragraph 3. Remove, "Rainwater infiltration is needed for adequate groundwater recharge... which can lead to increased risk of potential impacts from drought." See comment 2 [G-4] above.

RESPONSE: The County of San Diego respectfully disagrees with the commenter. Please see our response to G-4 above. Please note that the first sentence of the reference paragraph states, "In areas where groundwater recharge is desired." The County of San Diego is aware of areas of high groundwater within its jurisdiction, and will not permit infiltration type BMPs in such areas. However, other LID BMPs are appropriate in theses areas, such as disconnecting impervious surfaces, directing runoff over vegetated areas prior to draining into the MS4 to allow filtration and evaporation, street trees, vegetated roofs, and rain water harvesting.

G-6 LID Handbook. Page 12/Paragraph 2.1. Replace the word *"should"* in the statement: "Proposed stormwater infiltration plans, including permeable pavements, *should. . .,"* with the word *"shall."*

RESPONSE: Comment accepted. The appropriate change has been made. The wording has been changed to "Proposed stormwater "infiltration BMPs", including permeable pavements, shall be reviewed by a qualified, licensed professional to..."

G-7 **LID Handbook. Page 16.** Multiple Species Conservation Program (MSCP): "We appreciated the acknowledgement that compliance with the provisions of the MSCP and other biological and habitat protection ordinances and statues accomplishes one of the principal tenets of Low Impact Development by clustering development areas and creating large blocks of open space. In terms of watershed protection, the MSCP is

arguably the single most significant LID measure that has ever, or will ever be put in place in the County of San Diego. We believe that it is appropriate to acknowledge that relationship, and to provide LID credit to projects that accomplish this goal by setting aside or dedicating land for habitat or open space purposes. The larger focus should be on accomplishing the broader goals of LID and not simply whether those goals are accomplished by one piece of regulation or another."

RESPONSE: This is a duplicate of Comment G-1 above. As indicated above, the County of San Diego Departments of Planning and Land Use and Public Works anticipate looking at ways to offer LID credit to projects meeting MSCP and preservation goals in the future.

G-8 LID Handbook. Page 18. Update the checklist. Under the "Water" header add "Seeps or Springs" and under the "Soils" header, add "Low Permeability Soils, Expansive Soils, Collapsible Soils, Landslides, Other Geologic Hazards and Conditions."

RESPONSE: Comment accepted. The appropriate change has been made.

G-9 LID Handbook. Page 20. Last Sentence. Replace the following wording: "The standard CEQA... with mitigation ~~and offsite~~ through preserve creation..."

RESPONSE: Mitigation can occur on or off site, and doesn't always include preserve creation. This has been clarified with the following: "with mitigation elsewhere onsite or through offsite preserve creation"

G-10 LID Handbook. Page 22. 3rd Paragraph. Permeable patios and, in general, permeable pavements may not be appropriate immediately adjacent to building foundations. Also consider that private patios areas do not typically drain directly into a storm drain but into a landscape area.

RESPONSE: Comment noted. These types of details will be up to the project engineer and planner to decide on.

G-11 LID Handbook. Page 27. 4th Paragraph. A statement should be added following the statement "... decrease the need for additional traditional stormwater control methods..." that explains that projects must also comply with the current drainage design manual and the LID design solutions must handle/convey the design storm event.

RESPONSE: Comment accepted. The appropriate change has been made.

G-12 LID Handbook. Page 28. 2nd Paragraph. Remove sentence: "Because other infrastructure elements, such as sewer, power... these costs can also be reduced." Infrastructure costs vary substantially from site to site depending on many factors, not just the length or amount of material needed. While clustered subdivisions do generally reduce infrastructure costs, they also produce smaller lots, which have inherently less value than larger lots. In general, the manual should avoid rationalizing the economics of LID.

RESPONSE: Comment accepted. The appropriate change has been made.

G-13 LID Handbook. Page 29/1st Paragraph. Replace the following wording: "Conserving natural resources. . .allowing roof runoff to run into over the lawn or other landscaping ~~before entering the stormdrain~~ are ~~non-~~infiltration techniques…"

RESPONSE: Comment rejected. Please see the definition of Infiltration BMP.

G-14 LID Handbook. Page 32. 1st Paragraph. Add the following language (underlined) to the statement "… minimizes stream bank erosion from high velocity flows, meeting important hydromodification objectives."

RESPONSE: Comment accepted. The appropriate change has been made.

G-15 LID Handbook. Page 34. 4th Paragraph. Remove the word "finally" as follows: "~~Finally,~~ a portion of the required parking…" This is a solution which will most likely have very limited application.

RESPONSE: Comment accepted. The appropriate change has been made.

G-16 LID Handbook. The concept of reserve parking may be workable as long as there is regulatory flexibility to allow less than the total required parking to be provided on the site when the building is initially occupied, and as long as the parking provided is based on demad factors provided by the end user. This approach is probably not viable if the building is a "spec" building in which the end user is not know[n] as opposed to a building that is constructed for a specific, identified occupant.

RESPONSE: Comment noted. The County will be reviewing and revising the Parking Manual to be consistent with the LID requirements established in the Watershed Protection Ordinance. The comment will be taken into account during that review.

G-17 LID Handbook. Page 35, 4th Paragraph. Health and Safety Issue: Is permeable pavement patio appropriate for a restaurant from a public health standpoint?

RESPONSE: It is not clear what "health and safety issue" the commenter is concerned about. Assuming the concern is for bacteria associated with restaurant runoff, the RWQCB mandates that restaurant runoff must be treated to the maximum extent practicable prior to entering the MS4 and natural waterways that drain to waters with human beneficial uses (swimming, fishing). LID techniques offer a solution to reducing non-point source runoff from entering the MS4 by allowing potentially contaminated runoff to percolate through the soils allowing the natural process of pollutant degradation by microbes. Porous pavements offer an additional benefit by providing a hard surface barrier between these soils and human contact and will therefore potentially decrease human contact with the pollutants.

G-18 LID Handbook. Page 35. 4th Paragraph. Define what a "hybrid parking lot" is.

RESPONSE: A "hybrid parking lot" is defined in the Glossary, found in Appendix 1 of the LID Handbook. It is a parking lot that contains conventional impervious pavements

under driving and turning lanes, and pervious pavements under parking stalls and edges.

G-19 LID Handbook. Page 37. 2nd Paragraph. Replace the word "*should*" in the statement "… for a specific project *should* be reviewed…" with the word "*shall*".

RESPONSE: Comment accepted. The appropriate change has been made.

G-20 LID Handbook. Page 48, 1st Paragraph. Remove the following wording (strikeout) in the last sentence: ~~"Similar high land values are found throughout the San Diego Area, and a~~ As emphasis on stormwater management increase, the economic viability of these solutions may increase." ***The feasibility and marketability of LIT) in San Diego is not well understood at this time and high land values should not be a justification for increased regulatory standards (quite the opposite when weighing other important planning goals like affordable housing and economic growth).*** Instead, the manual should emphasize practical, proven techniques that are appropriate for San Diego's climatic and geologic conditions and avoid speculating on the feasibility of LID in the future.

RESPONSE: Comment accepted. The appropriate change has been made.

G-21 LID Handbook. Page 49. 3rd Paragraph. A bullet item should be added that discusses the limitations of LID on streets with a grade of 5% or greater. Streets, driveways and private roads with grades above 5% may present infiltration challenges as water infiltrates at the top of the street only to seep out at the bottom under hydrostatic pressure.

RESPONSE: Comment accepted. The appropriate change has been made. However, please note that even though <5% slope is appropriate for permeable pavements, swales and other LID techniques can be creatively engineered on slopes greater than 5%. An example of this can be seen in the City of Encinitas project, which successfully incorporated a hybrid weir/swale system on a slope greater than 5%, allowing for a short residence time for infiltration prior to running off into the MS4.

G-22 LID Handbook. Page 52, 1st full paragraph, Last Sentence. Replace the word "greatly" as follows: "… the impacts of streets on stormwater quality can be ~~greatly~~ effectively mitigated."

RESPONSE: Comment accepted. The appropriate change has been made.

G-23 LID Handbook. Page 57. 2nd Paragraph. Remove, "both the maintenance and cost implications of these designs can be balanced by the improved aesthetic and market appeal of driveways made from more attractive, more permeable pavements." See comment [G-16].

RESPONSE: Comment accepted. The appropriate change has been made.

G-24 LID Handbook. Page 58. 3rd Paragraph. Add the following sentence: "These designs can create significant maintenance issues however and they need to be landscaped appropriately.

RESPONSE: Comment accepted. The appropriate change has been made, incorporating alternative language. Drainage, climate, and maintenance must be considered with the design of this technique so that the landscape can be planned appropriately.

G-25 LID Handbook. Page 61. Section 3.6.5. It is not clear how a vegetated roof "extends the life of the roof." Most vegetated roofs will require at least one replacement in the typical life span of a concrete or ceramic tile roof, the standard Class A roofing material for San Diego County. Vegetated roofs are also expensive at $20+ per square foot. In a dry, sunny climate like San Diego's, more practical solutions might use the roof for solar and channel roof runoff into landscaped areas.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. As the commenter has noted previously, the Handbook should provide LID techniques and not discuss the economic feasibility of them. However, as research on green roofs has indicated, vegetated roofs do extend the life span of the typical roof. Please note the following excerpts:

- "Research does indicate that green roofs will actually last longer than conventional roofs because bituminous materials degrade faster when exposed to heat, and temperature fluctuations create thermal stress in the membrane affection long term performance. European research suggests that a green roof at least doubles the life span of a roof membrane" (Peck & Kuln in Dunnett & Kingsbury 2004 p.32; Kate Jenrick Dissertation on Green Roofs, March 2005).

- "Roof gardens protect roof membranes from ultraviolet radiation, extreme temperature fluctuations and puncture or other physical damage. Minimization of such exposure can improve the long term performance of the roofing system" (GreenGrid & Weston Solutions 2006; RoofGarden & Carlisle-Syntec Inc. 2006).

- "Protection of roof membrane resulting in a longer material lifespan (it is estimated that green roofs will last up to twice as long as conventional roofs), resulting in decreased maintenance and savings in replacement costs;" (www.greenroofs.org under About Green Roofs Tuesday, 31 May 2005).

- Green roofs paired with solar panels provide a cooling effect on the panels increasing their efficiency (International Green Roof Association, Global Networking for Green Roofs; Unterensingen, Germany Public School).

The developer must decide which LID techniques are appropriate and economical based on site constraints and desired site amenities. This will then be reviewed by the County of San Diego on a project-by-project basis, as appropriate.

G-26 LID Handbook. Page 64. 3rd Full Paragraph, Last Sentence. Replace the word "non-potable" with "recycled or reclaimed."

RESPONSE: Comment accepted. The appropriate change has been made.

G-27 LID Appendices, Page 23. The fire departments require an all-weather surface that meets their loading requirements. The typical scenario is the installation of the public streets fronting the development with the final lift of pavement occurring once construction is completed and the risk of damage removed. The finished streets are then turned over to the City.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, please note that the section was written by a County Fire Chief.

G-28 LID Appendices. Page 37. Limitations. Infiltration basins are not feasible if the site has a steep slope.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, please note that "steep terrain" has already been included as a limitation.

G-29 LID Appendices. Page 37. Economics. This section states that infiltration basins can be "relatively cost-effective" however these costs do not include the cost of the land for the basin and infiltration basins tend to be land intensive.

RESPONSE: Comment accepted. The appropriate change has been made, including language that land availability and cost should be taken into consideration.

G-30 LID Appendices. Page 37. Limitations. Extended detention (dry) ponds are not feasible if the site has a steep slope.

RESPONSE: Comment accepted. The appropriate change has been made.

G-31 LID Appendices. Page 37. Economics. This section states that extended detention (dry) ponds can be "relatively cost-effective" however extended detention (dry) ponds tend to be land intensive. See comment [G-30].

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, we respectfully disagree. Fact Sheet 3: Extended Detention (Dry) Ponds found on page 38-39 does not state that they can be "relatively cost-effective" under Economics. The section states "Least expensive stormwater quality pond option available..."

G-32 LID Appendices. Page 49. Design. A statement should be made to recommend that the mixing should be performed on-site so that a maximum of one hour between mixing and placing pervious concrete is maintained.

RESPONSE: Comment accepted. The appropriate change has been made.

G-33 LID Appendices. Page 53. Economics. Cost offsets may not occur due to the design storm requirement. In addition to incorporating LID techniques into projects, the municipalities Hydrology and Drainage Design Manuals must be satisfied for the design storm(s).

RESPONSE: The County of San Diego acknowledges and agrees with the comment. However, please note that the statement says "can" and not "will" off-set costs.

G-34 LID Site Design Examples. Some of the bulleted list of techniques at the bottom of each example have a footnote that says "Technique requires qualified, licensed professional's approval/' Most if not all LID techniques should require this review and approval, including many on the bulleted lists which do not have this footnote. It would be better to put the footnote on the word "techniques" so that the reviewer knows to have any LID techniques reviewed and approved first.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, the commenter's suggestion has been rejected. Infiltration BMPs are techniques that must be designed and/or reviewed by a certified professional as noted in the Handbook numerous times. "Infiltration Trenches", "Infiltration Basins", "Dry wells", and "Permeable Pavements without under-drains" are examples of "infiltration BMPs" that tend to be large in size, percolate deeply and have the potential to disrupt foundations, and down gradient properties if designed incorrectly. In addition to infiltration BMPs, LID techniques include a series of site design techniques (such as disconnecting pavements) and small techniques (such as a vegetated swale) that may have some "incidental infiltration" but are not designed to percolate deeply into the soil. Disconnecting impervious surfaces and allowing runoff to pass over landscaped/grassy areas prior to flowing into the MS4 is not increasing percolation significantly, they may have incidental infiltration into the landscape, but deep percolation (water deeper than the root zone) is not likely. As stated in the Municipal Permit Section D.1.d.(12) page 24, "restrictions are not intended to be applied to small infiltration systems dispersed throughout a development project". We do not want to restrict the use of these other simpler types of LID techniques by creating an additional hurdle for developers. However, "Infiltration BMPs" will continue to contain the footnote requiring the review of a qualified professional.

G-35 Various/ Throughout Replace, "a qualified, listened professional'" with, "Civil Engineer/ Professional Engineer" in both text and footnotes throughout.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, the commenter's suggestion has been rejected. The Technical Advisory Committee (TAC) discussed this phrase specifically, and it was decided by the group that "qualified, licensed professional" was more appropriate, since there are techniques that are specific to different professionals. For example, a Landscape Architect could be more appropriate for authority over vegetation and proper soil amendments for plant growth; while a hydrologist or geotechnical engineer would have other responsibilities. LID is a collaborative effort between many disciplines; all must work together and given the ability to do so.

This page intentionally left blank for reproduction purposes.

H. Letters from Richard R. Horner, Ph.D., dated August 24 and August 27, 2007

This page intentionally left blank for reproduction purposes.

RICHARD R. HORNER, PH.D.

230 NW 55TH STREET
SEATTLE, WASHINGTON 98107

TELEPHONE: (206) 782-7400
E-MAIL: rrhorner@msn.com

August 24, 2007

Ms. Christine Sloan
Watershed Project Manager
County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123

Dear Ms. Sloan:

Thank you for the opportunity to comment on San Diego County's Low Impact Development Handbook ("the LID Handbook"). Per the agreement that Gabriel Solmer of San Diego Coastkeeper worked out with you, my comments will arrive in two installments. This letter presents my review of all of the materials making up the LID Handbook, its references, and the appendices, except for the fact sheets in Appendix 4. I will submit additional comments covering the fact sheets before the end of August. Thank you for allowing that much needed extra time, as by the point I became aware of the document's issuance I had a very short time during a busy period to read and assimilate it.

I found the LID Handbook to be very comprehensive, thoroughly researched in the literature and referenced, well organized and written, and generally sound in its concepts and advice. I asked myself if I would find it to be a complete and convenient reference as a user and a document I would recommend to others, and my answers were positive, pending some instituting some improvements that I recommend in this letter. In particular, there are two significant areas in which the LID Handbook falls short in being the definitive guidance that the San Diego region needs to promote and implement its LID program:

- Over-reliance on survey-level soils and hydrogeologic information as a basis for eliminating soil-based LID opportunities; and

- Insufficient emphasis on water harvesting as an important category of LID practices that can be applied as alternatives and supplements to soil-based techniques.

I first elaborate on those areas before contributing some additional comments. Also by way of preliminary observations I want to make clear that my review focuses on the collection of practices discussed and the utility of the Handbook for someone seeking to implement LID practices, as opposed to the Handbook as a regulatory document that governs specific implementation decisions. I am aware that next year the County in conjunction with local cities will be proposing a revised

SUSMP, as required by the recently adopted San Diego MS4 permit. That document will presumably set specific regional requirements that govern implementation of LID practices, an important matter separate and apart from the description of LID techniques covered in the LID Handbook.

H-1

Over-Reliance on Soil Survey Information

The LID Handbook is heavily predicated on the Soil Survey, San Diego Area, California published in 1973 by the United States Department of Agriculture's National Resources Conservation Service (NRCS), formerly the Soil Conservation Service. Soil surveys can be very useful in making large-scale management decisions in a storm water program, but once site-specific implementation begins, it is important to verify site conditions and not exclude LID infiltration practices on the basis of the broad-scale mapping alone. Most pointedly from the standpoint of LID practices, the survey very broadly classifies the region's soil types in Hydrologic Soil Groups A-D, ranging from relatively high to low infiltration rates. If however the soil type at a site of interest deviates from the mapping, then the hydrologic class may very well differ also.

As Appendix 3B and references throughout the text indicate, the rough mapping and soil classification and the generalized conclusions of the soil survey are taken as the principal basis for the important decisions to be made on where and how soil-based, potentially infiltrative LID practices are to be specified. The document identifies areas with group A and B soils as candidates for infiltrative practices and those with C and D soils as essentially ineligible. There are two fundamental flaws in this approach. First, as discussed just above, the site conditions in any given instance may be more suitable for infiltration that indicated by reference only to regional survey data. The second flaw is that some soils that would not sufficiently infiltrate water in the natural state, including actual group C soils, can be remediated through soil amendment to provide adequate infiltration rates.

Thus, there are two classes of infiltration options: (1) what might be called "conventional" infiltration, in which water infiltrates the soils as they naturally exist via an infiltration basin or trench or some kind of pervious pavement; and (2) infiltration assisted through soil engineering methods, in which soil properties are amended (typically, with compost) to enhance infiltration. The LID Handbook properly and thoroughly recognizes these two options and the specific practices to implement them. However, by generically concluding that C and D soils are essentially ineligible for LID infiltration practices, workable opportunities in both conventional infiltration and soil amendment are missed. It is notable that conventional extended-detention ponds and swales built in unamended soils and tested in the San Diego area during Caltrans' Stormwater BMP Retrofit Pilot Program infiltrated a substantial amount of the inflow, in some cases the majority.

For the past eight years I have worked at the University of Washington with my colleague Steve Burges, an eminent hydrologist, to monitor and evaluate LID drainage systems installed as retrofits in the street conveyance systems by the City of Seattle. As in San Diego although with differing geological origins, the soil survey information suggests limitations in use of infiltrative techniques, with glacial till-underlain C soils showing up as particularly common. We found the City to be very successful, though, in reducing runoff and pollutants discharged to receiving waters by designing and building natural drainage systems with compost-amended soils. Seattle has two basic models

for these applications, bioretention cells used on relatively flat streets and stepped-pool "cascades" for more sloping streets. We monitored the street receiving the initial installation of the first type and found discharge to occur in every one of the 35 rainfall events observed in 2000, before retrofit; in less than 10 percent of the events in the first two years of operation; and not at all since December 2002, when the vegetation became relatively mature. That full attenuation of runoff occurred despite having the largest 24-hour rainfall in Seattle's recorded history in October 2003 and the wettest month in the entire record in November 2006. Our monitoring of a faster-flowing cascade revealed it to infiltrate or evapotranspire 75 percent of the inflow and reduce pollutant mass loadings by 60 to over 90 percent, depending on pollutant. More information is available at http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/index.asp.

Our experience has convinced Steve and me that the type of drainage systems we are studying can be successfully built and operated in all but heavy clay soils, through the use of routine, judicious engineering techniques and judgment. In addition to amending soils as needed, these practices include the use of sizing safety factors, a standard method in other fields like structural and mechanical engineering. Another possibility is to install an underdrain as a contingency, to be activated should a system placed in a relative restrictive soil unexpectedly not drain well. We have found that adjacent cells sometimes drain at differing rates, signifying the rapid local variation in soils. In that situation the system can be designed to allow excess from the slower draining cell to proceed to the one infiltrating faster. The LID Handbook should encourage and exemplify creative engineering of this type.

The ultimate solution, and what the LID Handbook should promote, is to collect site-specific soils and hydrogeologic data and require that the data be used before the suite of LID infiltration practices are rejected in areas that are generally considered to have C or D soils. San Diego County and its partner stormwater municipal co-permittees should start this effort by, first, collecting all recorded well log and boring data in the region and analyzing it to begin developing a finer characterization of soils and hydrogeology (especially, seasonal high groundwater level) than provided by soil surveys. Then, the municipalities should develop and specify standard procedures for new field data collection. The methods should be tailored for use by the jurisdictions themselves, to conduct representative testing in urban and urbanizing areas around the region, and designers and builders, for use at their development and redevelopment sites. The procedures should include:

- The use of standard percolation testing procedures to quantify infiltration rates;
- More advanced coring, boring, and soil sampling methods;
- Analyzing soil samples;
- The use of wells and piezometers to determine seasonal groundwater position; and
- Identifying any existing soil or groundwater contamination that may disqualify a site for infiltration.

These procedures are all fairly standardized and primarily need to be assembled in a convenient form for use by site developers. Caltrans produced a comprehensive procedure for investigating potential conventional infiltration sites (http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-03-025/IFB_Final_Report.pdf; see especially section 16.0 and Figure 32), which is adaptable to the LID realm.

The jurisdictions should use the experience gained in the representative data collection to refine the procedures. The LID Handbook should then present guidance in using the methods for site investigations by developers.

In many locations in the LID Handbook a warning appears that when contemplating infiltration, various factors must be reviewed by a qualified, licensed geotechnical, civil or other professional engineer. Once the procedures are incorporated in the LID Handbook, wherever that warning appears it should be enhanced by first stating, "Soils and hydrogeologic investigations must be performed according to the guidance in this handbook at all development, redevelopment, and potential retrofit sites to determine objectively workable opportunities for siting soil-based LID practices to the greatest extent possible."

H-2

Insufficient Emphasis on Water Harvesting

Water harvesting collects rainwater for some productive use, such as in irrigation or to supply gray water systems. The LID Handbook includes some elements of harvesting but does not sufficiently emphasize it. Since some of the soils will present some impediments to infiltrative practices, harvesting is a key component to get the most from the LID thrust and should get much more emphasis and coverage. Areas of the LID Handbook where harvesting should be inserted include but are not necessarily limited to:

- Page ES-2, 2nd full paragraph—There should be more general emphasis on harvesting.
- Section 1.3, 1st paragraph—The text notes that high density and vertical development limits LID solutions, but this is one area where harvesting can serve to alleviate those limitations at least in part.
- Section 1.3.2, top of page 12—Here is another place to indicate a role for harvesting, in this case in high groundwater areas.
- Section 1.3.3, 1st paragraph—This is yet another place to work in harvesting as a option where limitations on other methods legitimately exist.
- Table 3—The table includes rain barrels but neglects larger scale harvesting. Examples exist around the world of harvesting water from much larger buildings than could be served by a rain barrel, including vertically elevated as well as horizontally spread structures.

- Section 2.2.3, top of page 23—Here is one more place to suggest harvesting as a way to overcome limitations.

- Section 2.3—Harvesting can be a useful option for multi-family residential (2.3.1.3), commercial shopping center (2.3.2.1), commercial office building (2.3.2.2), commercial restaurant (2.3.2.3), and industrial park (2.3.3.1).

- Section 3.6.2—There should be an equivalent section covering harvesting applications at larger scales than cisterns and rain barrels.

Other Comments

H-3 Page ES-2, 2nd full paragraph—There are other uses for harvested water besides irrigation, particularly to supply gray water systems.

H-4 Section 1.3, 1st paragraph and, as appropriate, throughout—There should be more emphasis on the requirement that conventional stormwater best management practices be used to the extent that LID methods legitimately cannot and also to improve discharge quality of any remaining runoff when LID is used in part or in full at a given site.

H-5 Section 1.3.2—An additional benefit of LID methods is reduced cost compared to hard infrastructure like pipes and concrete.

H-6 Section 1.3.3—Another limitation that must be overcome is needlessly restrictive building codes, with street width standards and parking requirements being key areas in which to work to reduce hard infrastructure to that legitimately needed to serve its purposes.

H-7 Table 3—I think it would be a good idea to define each IMP. Those definitions could be placed in a box in the vicinity of the table for easy reference.

H-8 Table 3, section 3.1.3, and possibly other locations—Conventional biofiltration swales and filter strips (built in soils without amendments) can and usually do infiltrate some or even much of the inflow (see the note above about experience in Caltrans retrofit study). I believe it would be best to note that these biofiltration facilities can be constructed either in the conventional way for some flow attenuation benefit or, for generally improved flow reduction, as LID facilities through the use of soil amendments. The LID Handbook should clarify these points in all references to these practices.

H-9 Table 3—Do vegetated buffers include filter strips? Later text indicates that they do, but it should be made clear here.

H-10 Section 2.2.3, top of page 23—Pervious areas can be directly connected to the drain system, if they can't infiltrated or evaporate all incident rain and ultimately discharge to a drain inlet, conveyance, or water body.

H-11 Section 2.2.4—In my view the text here is too discouraging about avoiding soil compaction. Construction is frequently done in a careless manner, affecting areas where it does not have to intrude. This way of operating should be prohibited and better practices encouraged and guided by presenting specific practices, like the use of well defined clearing limits.

H-12 Section 2.3, 1st paragraph—I think this paragraph is too repetitive of earlier text.

H-13 Sections 2.3, 3—To me the way the text is formatted, with the large gaps, is distracting where a lot of illustrations appear.

H-14 Section 3.1.1—I recommend pointing out that attenuating all flow through infiltration and evapotranspiration is the only stormwater management practice that can be 100 percent effective in interdicting the transport of pollutants to receiving waters.

H-15 Section 3.1.1, Appendix 3D—Requiring 10 ft of separation between the base of an infiltration facility and seasonal high groundwater table in all cases is overly conservative. If all other conditions are acceptable, an infiltration device will perform well and not contaminate groundwater with 4 ft of separation, if it is assured that the water table in fact does not rise higher. That assurance can be gained through direct, site-specific investigation, as I advocate in my comments above. Caltrans' infiltration siting procedure, cited earlier, directs the analyst to consult the Regional Water Quality Control Board if the separation is in the interval 4-10 ft, presenting the evidence gathered in the field for a judgment on proceeding.

H-16 Section 3.1.2—There is some confusion here about pond terminology that should be cleared up. I am accustomed to using the joint term retention/detention pond to mean a structure whose purpose is flow rate control (the dual term because most ponds retain [infiltrate or evaporate] some water but discharge the remainder after detaining it for a while). An extended-detention pond to me is for rate control plus the degree of water quality benefits that can be gained from a 72-hour detention time. A wet pond has a permanent pool with a volume equal to the runoff volume produced by the water quality design storm, and thus a longer residence time for greater water quality benefit.

I would be pleased to discuss my comments with you and invite you to contact me if you wish.

Sincerely,

Richard R. Horner

Richard R. Horner

RICHARD R. HORNER, PH.D.

230 NW 55TH STREET
SEATTLE, WASHINGTON 98107

TELEPHONE: (206) 782-7400
E-MAIL: rrhorner@msn.com

August 27, 2007

Ms. Christine Sloan
Watershed Project Manager
County of San Diego
Department of Planning and Land Use
5201 Ruffin Road, Suite B
San Diego, California 92123

Dear Ms. Sloan:

This letter presents my review of the fact sheets in Appendix 4 of San Diego County's Low Impact Development Handbook ("the LID Handbook") and supplements the comments in my letter of August 24, 2007 covering the remainder of the LID Handbook. Thank you for the opportunity to submit these additional remarks.

General Comments

H-17

Water Harvesting:

Appendix 4 perpetuates a shortcoming I noted in the overall LID Handbook in my first letter: insufficient emphasis on water harvesting as an important category of LID practices that can be applied as alternatives and supplements to soil-based techniques. In the chart heading Appendix 4, dense developments should be checked as an application for harvesting. The fact sheets include one for cisterns and rain barrels but neglect larger scale harvesting. Examples exist around the world of harvesting water from much larger buildings than could be served by a rain barrel, including vertically elevated as well as horizontally spread structures. In downtown Seattle the King County Government Center collects enough roof runoff to supply 60-80 percent of the toilet flushing requirement and also irrigates plantings. These larger scale applications are still low impact development and can significantly benefit water conservation and the aquatic environment, which otherwise would be burdened with the runoff from large buildings. A fact sheet should be prepared to cover harvesting applications at larger scales than cisterns and rain barrels.

H-18

Presentation of Cost Data:

The various fact sheets should carefully reference the sources of construction and maintenance costs. I can find no direct references for the cost figures, although citation of a Wisconsin document in several places suggests that it is a source. Maintenance expenses are usually given as a

percentage of construction cost, presumably but often not stated on an annual basis. Again, there are no references for these numbers, and without documentation I tend to doubt the simple relationship between installation and operating costs.

Accounting is performed in a variety of ways by different entities, and not always objectively and carefully. It is not uncommon for public and private project developers to seize on ostensibly high costs, and even to inflate them, as justification for not applying perfectly practicable techniques that are best for the environment. An important advantage of LID treatment and conveyance methods, relative to traditional practices, generally is the lower cost of vegetative and soil-based infrastructure, compared to pipes and concrete. The LID Handbook should provide the best available cost information, thoroughly referenced, to give users a solid basis for comparing costs and stimulating LID use through cost incentives.

H-19

References to Other Handbooks:

I commented in my first letter that your LID Handbook is comprehensive, thoroughly researched, well organized and written, and generally sound. However, it does not alone present all of the guidance a user could benefit from, particularly for detailed design purposes. Other handbooks exist to fill that gap and should be referenced and recommended for use. Their specific relevant passages should be cited on each fact sheet, as appropriate. Most prominent among these other handbooks are the following:

Prince George's County. 2000. Low-Impact Development Design Strategies: An Integrated Design Approach, EPA 841-B-00-003. U.S. Environmental Protection Agency, Washington, DC.

Prince George's County. 2002. Bioretention Manual. Prince George's County, Largo, MD.

Puget Sound Action Team and Washington State University Pierce County Extension. 2005. Low Impact Development: Technical Guidance Manual for Puget Sound. Puget Sound Action Team, Olympia, WA.

Comments on Specific Fact Sheets

H-20

Fact Sheets 1, 2; Infiltration Trench, Infiltration Basin: An additional important guideline is that construction phase runoff cannot be allowed to enter these facilities and clog them.

H-21

Fact Sheet 3; Extended-Detention Basin: The residence time for best performance without risk of mosquito breeding should be 72 hours, not 24 hours.

H-22

Fact Sheets 4, 18; Swales: The fact sheets should note that swales can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently. Swales function best with a slope of 1.5 to 2.5 percent. With greater slopes check dams should be installed to reduce the effective slope to that range. Swales sloping less than 1.5 percent may not drain well enough for vegetation preferring well drained soils, and may need underdrains to distribute water through the soil or discharge it on

the surface. There is no automatic maximum area that can be drained to a swale; there must be sufficient space and it must be designed large enough to meet the stormwater management objective given the amount of flow that will be produced.

H-23 **Fact Sheet 5; Filter Strip:** The fact sheet should note that filter strips can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently. Other applications are at the edges of parking lots and along road shoulders. The maximum slope specified for filter strips in the Puget Sound area is 20 percent, not 5 percent. I believe this less restrictive condition is warranted; because, unlike swales, filter strips receive only dispersed, not highly erosive sheet flows. This same reason makes inspection a light burden, and I believe the fact sheet overstates the work load. There is no automatic maximum area that can be drained to a filter strip; there must be sufficient space and it must be designed large enough to meet the stormwater management objective given the amount of flow that will be produced.

H-24 **Fact Sheet 6; Sand Filters:** The fact sheet should note and illustrate the two basic types: the "Austin" design, which receives flow at a point, and the "Delaware" type, which takes sheet flow. This distinction is important, because they represent two different applications, the first where flow is already collected and the second where it is dispersed. The fact sheet should also state that sand filters can be constructed either open to the surface or fully underground and can have a hard bottom or be open to the soil for infiltration of the treated runoff.

H-25 **Fact Sheet 7; Bioretention:** The fact sheet should note that both conveyance and non-conveyance bioretention types can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently. Bioretention units often can fully infiltrate entering runoff, at least up to a point, and do not necessarily need an underdrain. There is no automatic maximum area that can be drained to a bioretention area; there must be sufficient space and it must be designed large enough to meet the stormwater management objective given the amount of flow that will be produced. Requiring 10 ft of separation between the base of a bioretention facility and seasonal high groundwater table in all cases is overly conservative. If all other conditions are acceptable, a bioretention device will perform well and not contaminate groundwater with 4 ft of separation, <u>if</u> it is assured that the water table in fact does not rise higher. That assurance can be gained through direct, site-specific investigation, as I advocated in my first letter. Caltrans' infiltration siting procedure, cited in that letter, directs the analyst to consult the Regional Water Quality Control Board if the separation is in the interval 4-10 ft, presenting the evidence gathered in the field for a judgment on proceeding. This comment about groundwater separation also applies to infiltration trenches and basins; Fact Sheets 1 and 2 oddly do not discuss separation but should, according to my comment here.

H-26 **Fact Sheets 8, 9; Pervious Concrete, Asphalt-Concrete:** Other applications are on edges, like road shoulders and the outer portion of parking lots, to manage not only the direct precipitation there but flow from the adjacent road or parking stalls. The same comment I made for bioretention regarding separation from groundwater also applies to this fact sheet.

H-27 **Fact Sheets 12, 16; Gravel, Private Road:** Gravel is not a LID technique if it gets any substantial weight loading and is compacted. I tested the performance of pervious asphalt alongside gravel and

conventional asphalt on a county road shoulder. The runoff coefficient from the gravel was not much less than off the conventional asphalt and much higher than from the pervious material. The fact sheet should restrict this practice to areas that will have no vehicle or other heavy equipment loading.

H-28 **Fact Sheets 14, 15; Street Design:** There has been a lot of thought about LID street design that should be referenced here and made available to LID Handbook users. I described my experience with City of Seattle street natural drainage systems in my earlier letter and referred you to the City's website at http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/index.asp. Stephanie Hurley and Megan Wilson completed a joint master's thesis at the University of Washington under my supervision in 2004 on the subject, with the title Great (Wet) Streets: Merging Street Design and Stormwater Management to Improve Neighborhood Streets. The file is far too large for me to send via e-mail, but I would be pleased to provide a copy by ftp or CD at your request.

H-29 **Fact Sheet 17; Curb Cut:** Curb cuts should have a vertical drop in addition to sufficient width to prevent clogging.

H-30 **Fact Sheet 19; Concave Median:** The fact sheets should note that these facilities can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently.

H-31 **Fact Sheet 20; Cul-de-sac:** The unpaved space within a cul-de-sac can reduce and treat runoff (e.g., through bioretention), in addition to reducing impervious area.

H-32 **Fact Sheet 25; Dry Well:** Roofs can drain to a "French drain" style small infiltration trench as well as a dry well, and that option should be covered in this or a companion fact sheet. Refer to the Washington Department of Ecology's Stormwater Management Manual for Western Washington (http://www.ecy.wa.gov/pubs/0510033.pdf), BMP T5.10 Downspout Dispersion in Volume V, page 5-3.

H-33 **Fact Sheet 30; Soil Amendment:** It should be specifically noted that applications include swales, filter strips, and bioretention when amendment can improve water storage and infiltration characteristics of the soils.

I would be pleased to discuss my comments with you and invite you to contact me if you wish.

Sincerely,

Richard R. Horner

Richard R. Horner

H. Letters from Richard R. Horner, Ph.D., dated August 24, 2007 and August 27, 2007

The County of San Diego received this comment letter after the close of public comment. However, the Dr. Horner did contact County staff prior to the close of the comment period, and relayed a number of his concerns to staff at that time. As such, his comments have been responded to here.

Letter from Richard R. Horner, Ph.D., Dated August 24, 2007

H-1 Over-reliance on survey-level soils and hydrogeologic information as a basis for eliminating soil-based LID opportunities. Excerpted from comments:

"The ultimate solution, and what the LID Handbook should promote, is to collect site-specific soils and hydrogeologic data and require that the data be used before the suite of LID infiltration practices are rejected in areas that are generally considered to have C or D soils. San Diego County and its partner stormwater municipal co-permittees should start this effort by, first, collecting all recorded well log and boring data in the region and analyzing it to begin developing a finer characterization of soils and hydrogeology (especially, seasonal high groundwater level) than provided by soil surveys. Then, the municipalities should develop and specify standard procedures for new field data collection. The methods should be tailored for use by the jurisdictions themselves, to conduct representative testing in urban and urbanizing areas around the region, and designers and builders, for use at their development and redevelopment sites. The procedures should include:

- The use of standard percolation testing procedures to quantify infiltration rates;
- More advanced coring, boring, and soil sampling methods;
- Analyzing soil samples;
- The use of wells and piezometers to determine seasonal groundwater position; and
- Identifying any existing soil or groundwater contamination that may disqualify a site for infiltration.

These procedures are all fairly standardized and primarily need to be assembled in a convenient form for use by site developers. Caltrans produced a comprehensive procedure for investigating potential conventional infiltration sites (http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-03-025/IFB_Final_Report.pdf; see especially section 16.0 and Figure 32), which is adaptable to the LID realm.

The jurisdictions should use the experience gained in the representative data collection to refine the procedures. The LID Handbook should then present guidance in using the methods for site investigations by developers.

In many locations in the LID Handbook a warning appears that when contemplating infiltration, various factors must be reviewed by a qualified, licensed geotechnical, civil or other professional engineer. Once the procedures are incorporated in the LID Handbook, wherever that warning appears it should be enhanced by first stating, "Soils and hydrogeologic investigations must be performed according to the guidance in this handbook at all development, redevelopment, and potential retrofit sites to determine objectively workable opportunities for siting soil-based LID practices to the greatest extent possible."

RESPONSE: The County of San Diego acknowledges and appreciates the comment. As of date, the seasonal high water table data isn't readily available in a GIS mapping format, and it will be difficult to know where that level is in many areas until that data is available. Until data is available, the water-table level will need to be determined by the project applicant. Therefore the County must be conservative in its regulations so that we do not create groundwater problems in the future. Presently, there is a requirement of 10 feet of separation between the base of an infiltration facility and the high groundwater table. This is standard County Policy and is required by the Regional Water Quality Control Board Municipal Permit. The 10 feet of separation applies to "Infiltration BMPs", which as defined by the County include "Infiltration Trench", "Infiltration Basin', "Dry Wells", and "Permeable Pavements without an underdrain". Other BMPs that have "incidental infiltration" such as swales, bioretention, and filter strips, are not considered infiltration BMPs. The TAC discussed the "10 feet of separation" requirement and felt that the conservative separation must stay in place until more research, water table data, and experience with "infiltration BMPs" are accumulated in the arid San Diego Region.

Please note that some of the comments are out of the scope of this document. It is not the intention of the LID Handbook to limit how a qualified, licensed geotechnical, civil or other professional engineer conducts their work, especially in light of potential new technologies.

H-2 Insufficient emphasis on water harvesting as an important category of LID practices that can be applied as alternatives and supplements to soil-based techniques.

Areas of the LID Handbook where harvesting should be inserted include but are not necessarily limited to:

- Page ES-2, 2nd full paragraph—There should be more general emphasis on harvesting.
- Section 1.3, 1st paragraph—The text notes that high density and vertical development limits LID solutions, but this is one area where harvesting can serve to alleviate those limitations at least in part.
- Section 1.3.2, top of page 12—Here is another place to indicate a role for harvesting, in this case in high groundwater areas.
- Section 1.3.3, 1st paragraph—This is yet another place to work in harvesting as a option where limitations on other methods legitimately exist.
- Table 3—The table includes rain barrels but neglects larger scale harvesting. Examples exist around the world of harvesting water from much larger buildings than could be served by a rain barrel, including vertically elevated as well as horizontally spread structures.

- Section 2.2.3, top of page 23—Here is one more place to suggest harvesting as a way to overcome limitations.
- • Section 2.3—Harvesting can be a useful option for multi-family residential (2.3.1.3), commercial shopping center (2.3.2.1), commercial office building (2.3.2.2), commercial restaurant (2.3.2.3), and industrial park (2.3.3.1).
- • Section 3.6.2—There should be an equivalent section covering harvesting applications at larger scales than cisterns and rain barrels.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, it should be noted that San Diego County in general has relatively few storm events per year and averages less than 10 inches a year. A rain barrel or cistern would fill up during those rain events and could be used as irrigation for a couple days after the event, but for the most part the barrel/cistern would be empty for much of the year. If a significantly larger cistern was created on/under the development site, the owner may be able to store enough water to last a longer amount of time. However, without an alternative source of water (graywater for example) the option may not be economically viable. That said, the Regional Water Quality Control Board is currently updating their Basin Plan so that Graywater Systems can obtain a waiver as an acceptable discharge. At which point, Graywater systems should become a more viable option for developers. Where appropriate, the text has been added to address this issue.

H-3 Page ES-2, 2nd full paragraph—There are other uses for harvested water besides irrigation, particularly to supply gray water systems.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, as discussed above, San Diego County in general has relatively few storm events per year and averages less than 10 inches a year. That being said, the County agrees that graywater systems could store water within the cistern supplementing the sparse rain events received in most of the arid San Diego region.

H-4 Section 1.3, 1st paragraph and, as appropriate, throughout—There should be more emphasis on the requirement that conventional stormwater best management practices be used to the extent that LID methods legitimately cannot and also to improve discharge quality of any remaining runoff when LID is used in part or in full at a given site.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. Under the Municipal Stormwater Permit, implementation of conventional stormwater BMPs is required regardless of the extent in which LID is used (or not used). Projects can not be approved unless minimal BMPs are implemented.

H-5 Section 1.3.2 — An additional benefit of LID methods is reduced cost compared to hard infrastructure like pipes and concrete.

RESPONSE: All cost references have been removed from the Handbook at the request from the LID Technical Advisory Committee. Even though costs for pipes and concrete may be reduced in some situations there are other situations where costs will increase do to specific site constraints and jurisdiction requirements.

H-6 Section 1.3.3—Another limitation that must be overcome is needlessly restrictive building codes, with street width standards and parking requirements being key areas in which to work to reduce hard infrastructure to that legitimately needed to serve its purposes.

RESPONSE: The County will be updating the Parking Manual in light of the new LID requirements. Road Standards (widths) are a result of specific Public Safety requirements dictated by the State and loosely based on "Average Daily Trips" per segment.

H-7 Table 3—I think it would be a good idea to define each IMP. Those definitions could be placed in a box in the vicinity of the table for easy reference.

RESPONSE: Specific IMPs are defined in the Glossary of the Appendix and characterized in the Fact Sheets. There is also a table in Appendix 4 prior to the Fact Sheets that specifies the action (retention, infiltration, filtration, reuse) of each IMP.

H-8 Table 3, section 3.1.3, and possibly other locations—Conventional biofiltration swales and filter strips (built in soils without amendments) can and usually do infiltrate some or even much of the inflow (see the note above about experience in Caltrans retrofit study). I believe it would be best to note that these biofiltration facilities can be constructed either in the conventional way for some flow attenuation benefit or, for generally improved flow reduction, as LID facilities through the use of soil amendments. The LID Handbook should clarify these points in all references to these practices.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. Even though biofiltration, swales and filter strips do have some "incidental infiltration" we must be careful labeling these techniques as infiltration devices. Pure "Infiltration BMPs" have strict restrictions placed on them due to geotechnical and groundwater concerns. LID BMPs such as these are intended to be small and dispersed throughout the site, as compared to conventional "infiltration BMPs" such as infiltration basins and trenches. Checking the infiltration box in Table 3 would therefore create confusion as it would be in conflict with the County's definition of Infiltration BMPs. For Section 3.1.3, the following sentence was added "Furthermore, biofiltration devices can be designed with soil amendments to allow for some flow attenuation."

H-9 Table 3—Do vegetated buffers include filter strips? Later text indicates that they do, but it should be made clear here.

RESPONSE: Comment accepted. The appropriate change has been made.

H-10 Section 2.2.3, top of page 23—Pervious areas can be directly connected to the drain system, if they can't infiltrated or evaporate all incident rain and ultimately discharge to a drain inlet, conveyance, or water body.

RESPONSE: The discussion on Section 2.2.3 at the top of page 23 is in reference to permeable pavements; when infiltration is not appropriate for permeable pavements they can still be used for filtration and evaporation when designed with an under drain. The following sentence has been revised: "...these reservoirs can be fitted with an under

drain to allow filtration, storage, and evaporation, prior to drainage into the municipal stormwater system."

H-11 Section 2.2.4—In my view the text here is too discouraging about avoiding soil compaction. Construction is frequently done in a careless manner, affecting areas where it does not have to intrude. This way of operating should be prohibited and better practices encouraged and guided by presenting specific practices, like the use of well defined clearing limits.

RESPONSE: Comment accepted. The appropriate change has been made.

H-12 Section 2.3, 1st paragraph—I think this paragraph is too repetitive of earlier text.

RESPONSE: The County of San Diego acknowledges and has made note of the comment.

H-13 Sections 2.3, 3—To me the way the text is formatted, with the large gaps, is distracting where a lot of illustrations appear.

RESPONSE: Comment accepted. The appropriate change has been made.

H-14 Section 3.1.1—I recommend pointing out that attenuating all flow through infiltration and evapotranspiration is the only stormwater management practice that can be 100 percent effective in interdicting the transport of pollutants to receiving waters.

RESPONSE: Comment accepted. The appropriate change has been made.

H-15 Section 3.1.1, Appendix 3D— Requiring 10 ft of separation between the base of an infiltration facility and seasonal high groundwater table in all cases is overly conservative. If all other conditions are acceptable, an infiltration device will perform well and not contaminate groundwater with 4 ft of separation, if it is assured that the water table in fact does not rise higher. That assurance can be gained through direct, site-specific investigation, as I advocate in my comments above. Caltrans' infiltration siting procedure, cited earlier, directs the analyst to consult the Regional Water Quality Control Board if the separation is in the interval 4-10 ft, presenting the evidence gathered in the field for a judgment on proceeding.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, the 10 feet of separation between the base of an infiltration facility and the high groundwater table is standard County Policy and is required by the Regional Water Quality Control Board Municipal Permit (Order No. R9-2007-001). Please see Response to Comment H-2 above. Further, as discussed in Response to H-1 above, to date the seasonal high water table data isn't readily available in a GIS mapping format, and it will be difficult to know where that level is in many areas until that data is available. Until that data is available the water-table level will need to be determined by the project applicant. Therefore the County must be conservative in its regulations so that we do not create groundwater problems in the future.

H-16 Section 3.1.2—There is some confusion here about pond terminology that should be cleared up. I am accustomed to using the joint term retention/detention pond to mean a structure whose purpose is flow rate control (the dual term because most ponds retain [infiltrate or evaporate] some water but discharge the remainder after detaining it for a while). An extended-detention pond to me is for rate control plus the degree of water quality benefits that can be gained from a 72-hour detention time. A wet pond has a permanent pool with a volume equal to the runoff volume produced by the water quality design storm, and thus a longer residence time for greater water quality benefit.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, we are unclear about the source of confusion. Modification has been made to the text in attempt to clarify things.

Letter from Richard R. Horner, Ph.D., Dated August 27, 2007

H-17 *Water Harvesting:* Appendix 4 perpetuates a shortcoming I noted in the overall LID Handbook in my first letter: insufficient emphasis on water harvesting as an important category of LID practices that can be applied as alternatives and supplements to soil-based techniques. In the chart heading Appendix 4, dense developments should be checked as an application for harvesting. The fact sheets include one for cisterns and rain barrels but neglect larger scale harvesting. Examples exist around the world of harvesting water from much larger buildings than could be served by a rain barrel, including vertically elevated as well as horizontally spread structures. In downtown Seattle the King County Government Center collects enough roof runoff to supply 60-80 percent of the toilet flushing requirement and also irrigates plantings. These larger scale applications are still low impact development and can significantly benefit water conservation and the aquatic environment, which otherwise would be burdened with the runoff from large buildings. A fact sheet should be prepared to cover harvesting applications at larger scales than cisterns and rain barrels.

RESPONSE: Comment accepted. The appropriate change has been made. Appendix 4 Table now includes a check next to urban.

H-18 *Presentation of Cost Data:* The various fact sheets should carefully reference the sources of construction and maintenance costs. I can find no direct references for the cost figures, although citation of a Wisconsin document in several places suggests that it is a source. Maintenance expenses are usually given as a percentage of construction cost, presumably but often not stated on an annual basis. Again, there are no references for these numbers, and without documentation I tend to doubt the simple relationship between installation and operating costs.

Accounting is performed in a variety of ways by different entities, and not always objectively and carefully. It is not uncommon for public and private project developers to seize on ostensibly high costs, and even to inflate them, as justification for not applying perfectly practicable techniques that are best for the environment. An important advantage of LID treatment and conveyance methods, relative to traditional practices, generally is the lower cost of vegetative and soil-based infrastructure, compared to pipes and concrete. The LID Handbook should provide the best available cost information,

thoroughly referenced, to give users a solid basis for comparing costs and stimulating LID use through cost incentives.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. Most references to cost have been kept very general (i.e. "Construction cost will depend on materials chosen.") after discussions with our Technical Advisory Committee. The costs used in the document were primarily from the CASQA New Development and Redevelopment Handbook.

H-19 *References to Other Handbooks:* I commented in my first letter that your LID Handbook is comprehensive, thoroughly researched, well organized and written, and generally sound. However, it does not alone present all of the guidance a user could benefit from, particularly for detailed design purposes. Other handbooks exist to fill that gap and should be referenced and recommended for use. Their specific relevant passages should be cited on each fact sheet, as appropriate. Most prominent among these other handbooks are the following:

- Prince George's County. 2000. Low-Impact Development Design Strategies: An Integrated Design Approach, EPA 841-B-00-003. U.S. Environmental Protection Agency, Washington, DC.
- Prince George's County. 2002. Bioretention Manual. Prince George's County, Largo, MD.
- Puget Sound Action Team and Washington State University Pierce County Extension. 2005. Low Impact Development: Technical Guidance Manual for Puget Sound. Puget Sound Action Team, Olympia, WA.

RESPONSE: Comment accepted. The appropriate change has been made. These guidance documents are included in the LID Literature Index.

H-20 Fact Sheets 1, 2; Infiltration Trench, Infiltration Basin: An additional important guideline is that construction phase runoff cannot be allowed to enter these facilities and clog them.

RESPONSE: Comment accepted. The appropriate change has been made.

H-21 Fact Sheet 3; Extended-Detention Basin: The residence time for best performance without risk of mosquito breeding should be 72 hours, not 24 hours.

RESPONSE: Comment accepted. The appropriate change has been made.

H-22 Fact Sheets 4, 18; Swales: The fact sheets should note that swales can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently. Swales function best with a slope of 1.5 to 2.5 percent. With greater slopes check dams should be installed to reduce the effective slope to that range. Swales sloping less than 1.5 percent may not drain well enough for vegetation preferring well drained soils, and may need underdrains to distribute water through the soil or discharge it on the surface. There is no automatic maximum area that can be drained to a swale; there must be sufficient space and it must

be designed large enough to meet the stormwater management objective given the amount of flow that will be produced.

RESPONSE: Comment accepted. The appropriate change has been made.

H-23 Fact Sheet 5; Filter Strip: The fact sheet should note that filter strips can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently. Other applications are at the edges of parking lots and along road shoulders. The maximum slope specified for filter strips in the Puget Sound area is 20 percent, not 5 percent. I believe this less restrictive condition is warranted; because, unlike swales, filter strips receive only dispersed, not highly erosive sheet flows. This same reason makes inspection a light burden, and I believe the fact sheet overstates the work load. There is no automatic maximum area that can be drained to a filter strip; there must be sufficient space and it must be designed large enough to meet the stormwater management objective given the amount of flow that will be produced.

RESPONSE: Comment accepted. The appropriate change has been made.

H-24 Fact Sheet 6; Sand Filters: The fact sheet should note and illustrate the two basic types: the "Austin" design, which receives flow at a point, and the "Delaware" type, which takes sheet flow. This distinction is important, because they represent two different applications, the first where flow is already collected and the second where it is dispersed. The fact sheet should also state that sand filters can be constructed either open to the surface or fully underground and can have a hard bottom or be open to the soil for infiltration of the treated runoff.

RESPONSE: Comment accepted. The appropriate change has been made.

H-25 Fact Sheet 7; Bioretention: The fact sheet should note that both conveyance and non-conveyance bioretention types can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently. Bioretention units often can fully infiltrate entering runoff, at least up to a point, and do not necessarily need an underdrain. There is no automatic maximum area that can be drained to a bioretention area; there must be sufficient space and it must be designed large enough to meet the stormwater management objective given the amount of flow that will be produced. Requiring 10 ft of separation between the base of a bioretention facility and seasonal high groundwater table in all cases is overly conservative. If all other conditions are acceptable, a bioretention device will perform well and not contaminate groundwater with 4 ft of separation, if it is assured that the water table in fact does not rise higher. That assurance can be gained through direct, site-specific investigation, as I advocated in my first letter. Caltrans' infiltration siting procedure, cited in that letter, directs the analyst to consult the Regional Water Quality Control Board if the separation is in the interval 4-10 ft, presenting the evidence gathered in the field for a judgment on proceeding. This comment about groundwater separation also applies to infiltration trenches and basins; Fact Sheets 1 and 2 oddly do not discuss separation but should, according to my comment here.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. Where appropriate, changes have been made. However, it should be noted that U.S. EPA recommends a 6 foot separation between the high groundwater mark and the ground surface for Bioretention sites: (US EPA (1999, September) BMP Fact Sheet 832-F-99-012. http://www.epa.gov/owm/mtb/biortn.pdf). Therefore the 6 foot separation in the LID Handbook will remain.

H-26 Fact Sheets 8, 9; Pervious Concrete, Asphalt-Concrete: Other applications are on edges, like road shoulders and the outer portion of parking lots, to manage not only the direct precipitation there but flow from the adjacent road or parking stalls. The same comment I made for bioretention regarding separation from groundwater also applies to this fact sheet.

RESPONSE: Comment accepted. The appropriate change has been made.

H-26 Fact Sheets 12, 16; Gravel, Private Road: Gravel is not a LID technique if it gets any substantial weight loading and is compacted. I tested the performance of pervious asphalt alongside gravel and conventional asphalt on a county road shoulder. The runoff coefficient from the gravel was not much less than off the conventional asphalt and much higher than from the pervious material. The fact sheet should restrict this practice to areas that will have no vehicle or other heavy equipment loading.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. Please note that gravel has been found to be a viable permeable option when used with the recommended "open-graded crushed rock base course". Gravel and rock swales must be encouraged and designed appropriately in the arid San Diego region.

H-28 Fact Sheets 14, 15; Street Design: There has been a lot of thought about LID street design that should be referenced here and made available to LID Handbook users. I described my experience with City of Seattle street natural drainage systems in my earlier letter and referred you to the City's website at http://www.seattle.gov/util/About_SPU/Drainage_&_Sewer_System/Natural_Drainage_Systems/index.asp. Stephanie Hurley and Megan Wilson completed a joint master's thesis at the University of Washington under my supervision in 2004 on the subject, with the title Great (Wet) Streets: Merging Street Design and Stormwater Management to Improve Neighborhood Streets. The file is far too large for me to send via e-mail, but I would be pleased to provide a copy by ftp or CD at your request.

RESPONSE: Comment accepted. The appropriate change has been made.

H-29 Fact Sheet 17; Curb Cut: Curb cuts should have a vertical drop in addition to sufficient width to prevent clogging.

RESPONSE: Comment accepted. The appropriate change has been made.

H-30 Fact Sheet 19; Concave Median: The fact sheets should note that these facilities can be constructed in either natural or amended soils, depending on the infiltration rate provided by the natural condition versus the rate needed to reduce surface runoff sufficiently.

RESPONSE: Comment accepted. The appropriate change has been made.

H-31 Fact Sheet 20; Cul-de-sac: The unpaved space within a cul-de-sac can reduce and treat runoff (e.g., through bioretention), in addition to reducing impervious area.

RESPONSE: Comment accepted. The appropriate change has been made.

H-32 Fact Sheet 25; Dry Well: Roofs can drain to a "French drain" style small infiltration trench as well as a dry well, and that option should be covered in this or a companion fact sheet. Refer to the Washington Department of Ecology's Stormwater Management Manual for Western Washington (http://www.ecy.wa.gov/pubs/0510033.pdf), BMP T5.10 Downspout Dispersion in Volume V, page 5-3.

RESPONSE: The County of San Diego acknowledges and appreciates the comment. However, he LID TAC voted not to include the French drain style infiltration trench. The Reference noted was accepted, and appropriate correction made.

H-33 Fact Sheet 30; Soil Amendment: It should be specifically noted that applications include swales, filter strips, and bioretention when amendment can improve water storage and infiltration characteristics of the soils.

RESPONSE: Comment accepted. The appropriate change has been made.